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DECEMBER, 1921 BULLETIN 224

Vermont Agricultural Experiment Station

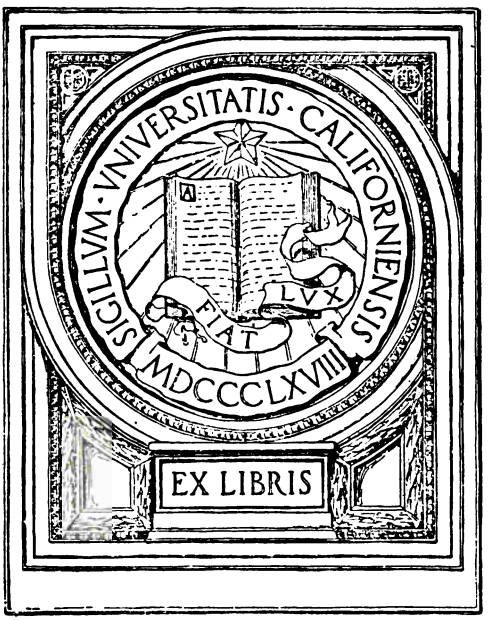
VIOLETS OF NORTH AMERICA

By EZRA BRAINERD

INTRODUCTION *by* G. P. BURNS

UC-NRLF
$B 73 187

Viola novae-angliae House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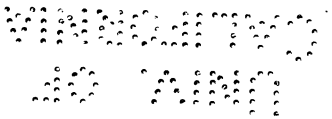

Species No. 1--Viola pedata L.

UNIV. OF CALIF.

DECEMBER, 1921 BULLETIN 224

University of Vermont and State Agricultural College

Vermont Agricultural Experiment Station

BURLINGTON, VERMONT

VIOLETS OF NORTH AMERICA

By EZRA BRAINERD

INTRODUCTION by GEORGE P. BURNS

BURLINGTON
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UNIV. OF

BULLETIN 224: VIOLETS OF NORTH AMERICA

By Ezra Brainerd[1]

CONTENTS

I.	Introduction	3- 5
II.	Violets of North America	6-164
III.	Violet Hybrids of North America	165-172

I. INTRODUCTION

By George P. Burns

It is not my purpose in this introduction to go into a detailed discussion of the problem of the origin of species, but only to outline the scope of the work reported in this bulletin and that of bulletins 217 and 218 of this Station as they relate to that question.

The method of the origin of new species is today the leading problem before those botanical workers who are interested in plant evolution. An explanation of the causes leading to those fundamental changes in a plant which botanists recognize as giving it specific rank is the most pressing of all evolutionary problems, important not only to those interested in pure science but also to those working in the field of plant breeding.

The beginning of the twentieth century may be justly regarded as an epoch making date in the history of botanical science. It was then that the validity of the theories of Mendel was first clearly recognized by botanists. The work of de Vries, who promulgated the theory of mutation and the principle of unit characters, appeared about this time. Focke and Sudre had already shown that hybridism had been responsible for numerous forms upon which evolution could work in the progress of plant life. Recently Lotsy has attacked the mutation hypothesis, claiming that all changes in living matter are due to hybridization and not to mutations. Two hypotheses, then, are now extant to account for the origin of new forms; the one maintaining that these arise spontaneously from existing species; the other claiming that changes in plants are due to recombinations of unit-characters due to hybridization. The number of possible combinations of unit-characters in the hybrid is always large, because each plant possesses many such unit-characters and the resulting hybrids are accordingly exceedingly

[1] President Emeritus of Middlebury College.

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variable. Hence it is of fundamental importance in any investigation which attempts a genetic study of the behavior of individual plants that, as a necessary preliminary step, an extended research be made to determine the antecedents of the individuals used.

The most promising material growing in the wild for testing the value of either of these hypotheses would be a genus or genera in which there are well defined species with numerous intermediate forms—hybrids or elementary species. Two such polymorphic genera are Rubus and Viola. Brainerd has studied these two genera intensively for over 25 years. Early in his systematic work he became "painfully aware of the confusion that had arisen from publication of scores of obscure and illegitimate species in these two genera based on scanty or immature material."

His method in both genera has been the same. It consisted in:

(1) An examination of all the material in the principal herbaria.

(2) A comprehensive study of the distribution of the plants growing in their native habitats by means of many personal excursions and with the help of many co-laborers.

(3) An experimental analytical study of the individual plants.

(4) A synthetic study of the forms by crossing.

In later years Peitersen became associated with him in his study of Rubus and the work as outlined above was completed and the results published.[1] Brainerd has completed the first three phases of the work with Viola, but the fourth remains to be done.

From May, 1902 to October, 1903, Brainerd devoted his time principally to work in the field, collecting and examining some 2,000 to 3,000 plants from over 200 stations in western New England and western Massachusetts. Much of this material was examined and discussed by expert students of the genus. In his study of the literature he found that, for the most part, students of violets had not paid sufficient attention to the development of the plant during the summer months and he was the first to show the outstanding importance of studying the mature plant, bearing apetalous flowers and capsules.

Later, a wealth of material, consisting of living plants from all parts of the country, was collected in his garden and grown under similar cultural conditions to determine which variations found could be attributed to environmental factors and which to fundamental differences in the germ plasm. Some idea of the extent of his garden study may be gained from the fact that his collection consisted at one time of approximately 3,500 plants of about 650 different numbers, some 200 of which were from the wild and 450 raised from seeds.

[1] Vt. Sta. Buls. 217, 218 (1920).

These studies awakened his suspicion of hybridism and he published in 1914 his first triangle which aimed to express the genetic relationship of the violets of western Vermont. In fact, this triangle shows that in the five species which had been most thoroughly studied, were to be found eight of the ten possible hybrids that might result from their inbreeding.

When the idea that many of the intermediate plants might be hybrids was reached, an experimental method was at hand to test its truth. Thus it was possible for him to test the accuracy of his systematic work by sowing in his garden the seed from the various forms found there. In this way he was able to determine which were good, i. e., valid, species, which were hybrids and, furthermore, to determine the parents of any hybrid. This work was analytical. At present he has in his herbarium the enormous number of 984 sheets of specimens of violet hybrids from the wild and from garden cultures which represent 89 distinct hybrids.

The results of the work have been discussed as shown by the list of publications at the end of this bulletin. Some of the more important data may be summarized here. The numerous forms found in the wild may be grouped into three classes, species, hybrids and anomalous forms which are normally fertile and come true to seed. These last named forms are the result of hybridism in the remote or recent past. In this way new forms have arisen which, although of hybrid origin, are distinct and stable and, if fairly widespread, may be entitled to specific rank. His experimental work, with that of Peitersen, has shown the great wealth of new forms furnished by hybridization upon which natural selection may operate. This work represents one of the most illuminating researches of the present time, throwing light on the problem of the origin of species. It marks an enormous advance in the methods of the systematic botanist.

In view of the fact that the composition of plants found growing in the wild is so uncertain, I believe that such a study as is here presented is absolutely indispensable to determine the relationship of the species in any genus of plants. All work in plant breeding should be preceded by such a preliminary experimental analysis of the plants to be used as parents before actual breeding experiments are begun. Only thus can the experiments themselves be properly conducted; only thus can reliable results be secured.

We wish to acknowledge the assistance which W. W. Eggleston of the Bureau of Plant Industry has rendered in reading of proof and in checking references.

II. VIOLETS OF NORTH AMERICA

By Ezra Brainerd

A. Acaulescent or without manifest stems.

a. Rootstock fleshy and thickened, without stolons.

b. Cleistogamous flowers in raceme-like branches.

Leaves of raceme one or less; seeds gray.

41. **V. rotundifolia.**

Leaves of raceme several; seeds brown.

42. **V. orbiculata.**

bb. Cleistogamous peduncles from rootstock.

c. Petals all beardless, apetalous flowers wanting, upper petals dark violet, others lilac-purple.

1. **V. pedata.**

cc. Lateral petals bearded; cleistogamous flowers abundant; petals all normally violet-purple; freely hybridizing—only three species in Synoptical Flora.

1. Cleistogamous flowers ovoid on short prostrate pedicels; capsules purplish.

Leaves usually cut.

Leaves all palmately 5-11-lobed or -parted.

Plants villous-pubescent.

2. **V. palmata.**

Plants nearly or quite glabrous.

Seeds brown.

3. **V. Egglestoni.**

Seeds buff.

4. **V. Stoneana.**

Earliest and latest leaves usually uncut, others pedately 3-7-lobed; seeds generally buff.

Plants villous-pubescent.

12. **V. triloba.**

Plants obscurely pubescent or glabrate; flowers deep purple; inhabitant of shady uplands.

11. **V. Lovelliana.**

Plants glabrous; flowers pale violet; inhabitant of wet woods.

6. **V. esculenta.**

Leaves all uncut.

Plants nearly or quite glabrous.

Petals violet-purple; seeds brown.

Petioles glabrous; plants of moist soil.

5. **V. papilionacea.**

Petioles puberulent; plants of dry soils.

7. **V. latiuscula.**

Petals rose-purple; seeds buff.

8. **V. rosacea.**

Petals pale-violet or white; seeds buff.

Vernal leaves narrow, gradually attenuate.

9. **V. missouriensis.**

Vernal leaves broad, subcordate.

10. **V. floridana.**

Plants pubescent.

Plants villous-pubescent, especially on petiole and lower leaf-surface; seeds dark brown.

13. **V. sororia.**

Plants hirsutulous on the upper-leaf surface; elsewhere glabrous; seeds buff.

14. **V. hirsutula.**

2. Cleistogamous flowers on long ascending peduncles, their capsules more or less purplish.

Leaves pubescent beneath and on the petioles.

Sepals and their auricles ciliolate; blades broadly ovate, cordate.

15. **V. septentrionalis.**

Sepals and auricles not ciliolate; blades at flowering time narrowly ovate.

16. **V. novae-angliae.**

Leaves glabrous beneath and on the petioles.

Leaves at vernal flowering narrowly cordate-acuminate; seeds buff.

Auricles of sepals short appressed.

17. **V. affinis.**

Auricles of sepals 2 mm. long, spreading.

18. **V. Langloisii.**

Leaves at vernal flowering subcordate, 3-lobed; seeds bronze.

19. **V. chalcosperma.**

3. Cleistogamous flowers on erect peduncles, their capsules green.

Leaves ovate to reniform, cordate, glabrous, uniformly crenate-serrate.

Cleistogamous flowers ovoid; spurred petal villous.

20. **V. nephrophylla.**

Cleistogamous flowers long and slender; spurred petal glabrous.

21. **V. cucullata.**

Leaves lobed, or margins sharply incised or toothed towards the cordate or truncate base.

Spurred petal glabrous, lateral with clavate beard; leaves lobed.

22. **V. viarum.**

Spurred petal villous at base, the lateral ones with capillary beard.

Foliage finely pubescent.

Leaves ovate to orbicular, obtuse.

23. **V. villosa.**

Leaves ovate-oblong, acute.

24. **V. fimbriatula.**

Foliage nearly or quite glabrous.

All leaves uncut.

Leaves oblong-lanceolate, incised at base.

25. **V. sagittata.**

Leaves deltoid to broadly ovate, coarsely toothed at base.

26. **V. emarginata.**

Leaves usually cut.

Segments 2-3-cleft into linear or oblanceolate lobes; eastern.

27. **V. Brittoniana.**

Segments 2-cleft, the divisions often 2-4-lobed; western.

28. **V. pedatifida.**

Middle segment uncut, the outer usually 2-4-cleft; southern.

29. **V. septemloba.**

aa. Rootstock slender; plants bearing stolons (excepting 30, 32); flowers white, yellow or violet.

b. Petals lilac or pale violet.

c. Stolons lacking; leaves minutely pubescent on the upper surface; spur large, 7 mm. long.

30. **V. Selkirkii**

cc. Stoloniferous; leaves flabrous throughout; spur short, 2 mm. long.

31. **V. palustris.**

bb. Petals white, with dark purple lines on the three lower.

c. Cleistogamous flowers on prostrate peduncles, their capsules ovoid commonly reddish-brown; plants of cold ravines and low rich woods.

Stolons lacking; lateral petals beardless; leaves reniform.

32. **V. renifolia.**

Stoloniferous.

Lateral petals bearded; seeds obtuse at base.

33. **V. incognita.**

Lateral petals beardless; seeds acute at base.

34. **V. blanda.**

cc. Cleistogamous flowers on erect peduncles, their capsules ellipsoid, green; plants of open bogs.

Leaves ovate to oblong.

Leaves ovate cordate.

Leaves toothed; eastern.

35. **V. pallens.**

Leaves entire; western.

36. **V. Macloskeyi.**

Leaves oblong, tapering at base.

37. **V. primulifolia.**

Leaves lanceolate or elliptical.

Leaves elliptical; Pacific coast.

38. **V. occidentalis.**

Leaves lanceolate; eastern.

Leaves 10 to 15 mm. wide.

39. **V. lanceolata.**

Leaves 4-10 mm. wide.

40. **V. vittata.**

AA. Caulescent, or with manifest stems.

a. Leaves cut or lobed.

b. Flowers yellow.

Leaves and sepals ciliate-pubescent.

49. **V. chrysantha.**

Leaves and sepals puberulent.

50. **V. Sheltonii.**

bb. Flowers with upper petals dark purple; other petals lighter.

Leaves hirsutulous; lower petals light purple to whitish.

51. **V. Beckwithii.**

Leaves glabrous; lower petals yellowish.

Leaves veined, stipules large.

52. **V. Hallii.**

Leaves 3-ribbed; stipules small.

53. **V. trinervata.**

aa. Leaves entire.

b. Flower yellow.

First peduncles from the base of the stem.

Flowers on long peduncles much exceeding leaves.

45. **V. pedunculata.**

Flowers on short peduncles.

Leaves oblong-lanceolate, attenuate at base, usually glabrous.

46. **V. Nuttallii.**

Leaves ovate abruptly cuneate, usually pubescent.

Leaves obscurely dentate.

47. **V. praemorsa.**

Leaves 5-7 markedly dentate.

48. **V. purpurea.**

First peduncles from upper half of stem.

Rootstocks filiform; stems spreading or procumbent.

Stems spreading, sometimes rooting at nodes; leaves evergreen.

43. **V. sarmentosa.**

Stems weak, 2-3 leaves; leaves deciduous.
44. **V. biflora.**

Rootstock short, thick, stems erect.
Leaves lobed.
Upper stipules large and fóliaceous; Pacific coast.
55. **V. lobata.**

Upper stipules small; eastern.
56. **V. tripartita.**

Leaves uncut.
Nearly glabrous.
Leaves round-cordate; western.
57. **V. glabella.**

Leaves halberd-shaped; eastern.
54. **V. hastata.**

Pubescent.
Sparingly pubescent; root-leaves usually 1-2; stem leaves rarely over 7 cm. wide.
58. **V. eriocarpa.**

Softly pubescent; root-leaves often wanting; stem-leaves broad, often over 7 cm. wide.
59. **V. pubescens.**

bb. Flowers not yellow.
c. Petals white or lavender.
Petals white.
Underground stolons present.
60. **V. rugulosa.**

Underground stolons lacking.
Sepals subulate, entire.
Upper petals white.
Stems usually 15-35 cm. high.
61. **V. canadensis.**

Stems usually 10-15 cm. high.
62. **V. scopulorum.**

Upper petals purple.
Leaves cordate.
63. **V. ocellata.**

Leaves cuneate.
64. **V. cuneata.**

Sepals oblong-lanceolate, fimbriate.
66. **V. striata.**

Petals lavender.

65. **V. Flettii.**

cc. Petals violet or purple.

Spur short; style much enlarged upward into a globose, hollow summit; annual.

75. **V. Rafinesquii.**

Spur long (2-12 mm.); style not capitate; perennials.

Stems stolon-like below ground, low and weak above.

73. **V. Langsdorfii.**

Stems not stolon-like below, high and well developed above.

Spur 7-12 mm. long, style glabrous.

74. **V. rostrata.**

Spur 2-6 mm. long; styles pubescent towards summit.

Stems prostrate, often rooting at the nodes.

Leaves reniform-cordate; southeastern United States.

69. **V. Walteri.**

Leaves oblong-cordate; New Mexico.

70. **V. reptans.**

Stems erect or ascending, not rooting.

The few cauline stipules mainly entire, subradical ones lacineate-dentate.

72. **V. Howellii.**

Stipules from serrate to fimbriate-pinnatifid or pectinate.

Leaves orbicular.

Stipules ovate lanceolate bristly serrate; leaves often 4.5 cm. wide.

67. **V. conspersa.**

Stipules linear, entire except at base; leaves not over 2 cm. wide.

68. **V. labradorica.**

Leaves ovate.

71. **V. adunca.**

SPECIES OF NORTH AMERICAN VIOLA NORTH OF MEXICO, ARRANGED ACCORDING TO AFFINITIES

No.		No.		No.	
1.	V. pedata*	27.	V. Brittoniana*	53.	V. trinervata†
2.	V. palmata*	28.	V. pedatifida*	54.	V. hastata*
3.	V. Egglestonii*	29.	V. septemloba*	55.	V. lobata†
4.	V. Stoneana*	30.	V. Selkirkii*	56.	V. tripartita§
5.	V. papilionacea*	31.	V. palustris*	57.	V. glabella†
6.	V. esculenta§	32.	V. renifolia*	58.	V. eriocarpa*
7.	V. latiuscula*	33.	V. incognita*	59.	V. pubescens*
8.	V. rosacea§	34.	V. blanda*	60.	V. rugulosa*
9.	V. missouriensis*	35.	V. pallens*	61.	V. canadensis*
10.	V. floridana§	36.	V. Macloskeyi†	62.	V. scopulorum* Boulder, Colo., etc.
11.	V. Lovelliana§	37.	V. primulifolia*		
12.	V. triloba*	38.	V. occidentalis†	63.	V. ocellata†
13.	V. sororia*	39.	V. lanceolata*	64.	V. cuneata†
14.	V. hirsutula*	40.	V. vittata§	65.	V. Flettii†
15.	V. septentrionalis*	41.	V. rotundifolia*	66.	V. striata*
16.	V. novae-angliae*	42.	V. orbiculata†	67.	V. conspersa*
17.	V. affinis*	43.	V. sarmentosa†	68.	V. labradorica*
18.	V. Langloisii§	44.	V. biflora†	69.	V. Walteri*
19.	V. chalcosperma§	45.	V. pedunculata†	70.	V. reptans§ Robinson Contrib. from Gray Hb.
20.	V. nephrophylla*	46.	V. Nuttallii*		
21.	V. cucullata*	47.	V. praemorsa†		
22.	V. viarum*	48.	V. purpurea†	71.	V. adunca*
23.	V. villosa*	49.	V. chrysantha†	72.	V. Howellii†
24.	V. fimbriatula*	50.	V. Sheltonii†	73.	V. Langsdorfii†
25.	V. sagittata*	51.	V. Beckwithii†	74.	V. rostrata*
26.	V. emarginata*	52.	V. Halliii†	75.	V. Raffinesquii*

The 46 species marked * are in the Atlantic Basin and north of Lat. 37°.
The 9 species marked § are in the Atlantic Basin but only south of Lat. 37°.
The 20 species marked † are only in territory draining into the Pacific.

75 Total.

Species No. 1—Viola pedata Curtis not L.

Viola pedata L. Sp. Pl. 933. 1753. Species No. 1.

Our color-plate represents the violet of eastern North America that was the first to awaken the admiration of Europeans. The deep purple of the upper petals and the lighter color with dark veins of the three lower ones made it a rival of the pansy. Its gracefully dissected foliage suggested to Linnaeus the name of *pedata,* the Bird-foot Violet. It often assumes, however, a less ornate attire in which all the petals have the lilac-purple of the three lower ones of the type. This was published with a plate in 1789,[1] which unfortunately was taken to represent the real *V. pedata* of Linnaeus, an error that was corrected *only 107 years* later by Greene,[2] who saw the pansy-like form in the vicinity of Washington for the first time in 1896 when entering upon his duties there as Professor of Botany in the Catholic University. The species appears here and in the Alleghanies of western Virginia at its best estate. It was from this vicinity that the oldest collection of the Linnaean material for *V. pedata* was made in 1688. Farther south it recedes from the tide-water plains of the Carolinas, Georgia, and Florida; but in the uplands of the Piedmont region and from western Florida to southwestern Louisiana,[3] large-flowered, concolorous plants are found that match perfectly a water-color of LeConte in which the spread of the corolla is 1.6 inches. This form Greene has published[4] as *V. ampliata. V. redunca* House[5] is another form from the high mountains of South Carolina and Georgia. In short, *V. pedata* is one of our most polymorphic species. Additional names are *V. digitata* Le Conte, var. *bicolor* Pursh, var. *atropurpurea DC., V. flabellifolia* Lodd., var. *flabellata* Don, var. *inornata* Greene, var. *concolor* Theo. Holm.

[1] Curtis, Bot. Mag. Vol. 3, t. 89. 1789. See line-drawing. Sp. No. 1.
[2] Pitt. 3: 33.
[3] See Brainerd's Distrib. of Violets, No. 117. "Openings in forest of long-leaved pine, Seale, La., March 27, 1910." Cf. Nos. 118 and 119.
[4] Leaflets 1, 2-3. 1903.
[5] Torreya 6: 171-2. Aug., 1906.
See also frontispiece color-plate, Species No. 1.

Species No. 2a—**Viola palmata** L.

Species No. 2b—**Viola palmata** L.

Species No. 3—Viola Egglestonii Brainerd

Viola palmata L. Sp. Pl. 933. 1753. Species No. 2.

The oldest plate is No. 477, fig. 9 of Plukenet's Amaltheum, of a plant from Florida. This specimen is now in Herbarium Sloane, London. Mr. E. G. Baker reports in Journal of Botany for April, 1898, that it is in part distinctly pubescent, and is well represented by the fig. in Britton's Illustrated Flora, 1st ed., 2: 446. 1897—repeated in 2nd ed., fig. 2924, p. 547. 1913.

Our first line-drawing represents a plant from the most northerly station, Great Barrington, Mass., May 21, 1903, and our second, a plant from near Jacksonville, Fla., March 24, 1909. The northern specimen is more pubescent in accordance with a general law that cool, moist conditions favor pubescence. Otherwise the two plants are much alike, showing no undivided leaves.

See cuts on pages 16 and 17.

Viola Egglestonii Brainerd, Bull. Torr. Cl. 37: 526-7, pl. 34, 35, Nov., 1910. Species No. 3.

This species was collected by Eggleston in the limestone barrens of West Nashville, Tenn., May 26, 1909. Of the four plants sent by him two were published as the type and deposited in the herbarium of the New York Botanical Garden. Our line-drawing is from one of the other two plants. The species, though markedly distinct, is intermediate between *V. palmata* and *V. Stoneana*. Like the latter its range is as yet quite restricted. In the National Museum is a specimen collected by Mr. Williamson near Nashville, Tenn., July, 1897, but named by Pollard *V. viarum*. A still older specimen is in the herbarium of the Missouri Botanical Garden collected May 13, 1881, by Dr. A. Gattinger at La Vergne, Tenn., 15 miles southeast of Nashville. But it is of more interest to find at St. Louis a specimen from Bowling Green, Ky., by Miss Sadie F. Price, April 11, 1899, labelled, "*V. falcata* Greene," for the species is thus entitled to recognition in the Floras of the Northeastern United States.

Both flowering and fruiting specimens are to be seen in my Distribution of Eastern North American Violets, 1910, Nos. 43 and 44.

Species No. 4—**Viola Stoneana** House

Viola Stoneana House, Bull. Torr. Cl. 32: 253-4, pl. 16. 1905. Species No. 4.

Viola septemloba Stone, not LeConte, Proc. Acad. Nat. Sci. Phil. 55, p. 678, pl. 35, fig. 2, and pl. 39, fig. 3. 1903.

This species is a near ally of *V. palmata* but less pubescent, and often bearing in early spring one or more small undivided leaves. It is of limited range—moist woodlands New Jersey, eastern Pennsylvania to the vicinity of the District of Columbia. The line-drawing is from a water-color painted from a herbarium specimen transplanted from the type station, Kennett Square, Chester Co., Pa. It is Nos. 162 and 163 of my Distribution of Eastern North American Violets, 1910.

Viola papilionacea Pursh, Fl. Am. Sept. 1: 173. 1814. Species No. 5.

We translate the Latin part of Pursh's excellent description as follows: Leaves cordate-deltoid, acute, crenate, somewhat cucullate, nearly glabrous; peduncles the length of the leaves; petals obovate, the three lower bearded below the middle, connivent, the two upper reflexed—"Near Philadelphia, in wet places; flowers blue, elegantly striated and bearded with yellow down." The beard, however, is not yellow, but the throat of the lower petal is a greenish yellow, and against this background the beard might easily appear to be yellow.

The specific name, as Greene observes, is most appropriate, as the shape of the flower resembles that of the garden pea (*not* the Papilio or butterfly of the entomologist), the peculiarly long and narrow keel-petal being concave and boat-shaped. It is, therefore, strange that the name given by Pursh was for 86 years rarely recognized by American botanists until Greene discussed its claims in 1900.[1]

In 1897 the species had appeared in Britton's Illustrated Flora as *V. obliqua* Hill., a vague name accompanied by a still vaguer plate, never quite understood, but applied by violet students, as a convenient makeshift, to some dozen different species. Cf. *V. laetecaerulea* Greene, Proc. Biol. Soc., Wash., 14, p. 70. 1901.

The plant is common in moist fields and grows over a wide tract of the eastern United States—from Maine to Minnesota, thence southward to Georgia and Oklahoma, and did not wholly escape the notice of botanists. LeConte in his monograph of Viola in 1826 recognizes it, but as a variety of *"V. cucullata."* He states that it is abundant on the island of Analostan in the Potomac River opposite Georgetown. One of his water-colors is unquestionably the plant of Pursh. Another synonym is *V. domestica* Bicknell,[2] so called because often found about dwellings and, lastly, *V. pratincola* Greene[3] from the prairies of the Middle West appears not to be specifically distinct.

[1] Pitt. 4: 140-1. March, 1900.
[2] Appendix Ill. Fl. 3: 519. 1898.
[3] Pitt. 4: 64. July, 1899.
See color-plate, Species No. 5, opposite page 32.

Some account should be given of the beautiful albino forms of this species that occur both in the North and the South.

1. A luxuriant plant has been cultivated for many years in eastern Vermont whose history we have learned through the kindness of Mrs. Laura D. Morgan of Woodstock. Miss Bessie Hewitt of North Pomfret, Vt., when a pupil at Mount Holyoke Seminary in South Hadley, Mass., was the first collector of this albino. Miss Shattuck, the Professor of Botany, determined it to be a variety of *"V. cucullata"* Gray Man., edition 5 (now considered *V. papilionacea*). The living plant was widely distributed and often used for house decoration. In 1909, Mr. Walter Deane of Cambridge, Mass., sent the very same albino from the garden of Mr. Brewster. It is notable for its complete lack of violet pigment in corolla, capsule and seed.

2. Similar albinos have been received from meadows of the Connecticut River at Glastonbury, Conn., growing with the purple-flowered form; and also from New London, Conn.

3. Most interesting of all is an albino from Bowling Green, Ky., *V. Priceana* Pollard. On April 1, 1910, the writer found it growing in the streets of Mena, Ark., where it was known as the "Confederate violet"—the gray petals with purple center suggesting the color of the Confederate uniform. It is a fine garden plant, hardy at the North and still flourishing in the writer's garden.

Our color-plate of typical *V. papilionacea* is based on specimens sent by Greene in 1902 from Washington, D. C., Nos. 103-108, Distribution of 1910.

Species No. 6—Viola esculenta Ell.

Viola esculenta Ell., Bot. S. C. & Ga., 1: 300. 1816. Greene, Pitt. 3: 314. May, 1898. Species No 6.

The type of Elliott's species I have examined in the Elliott herbarium now in the Charleston Museum. The ticket is ambiguously labelled *"Viola esculenta* mihi:" and underneath "Heterophylla Muhl." But when published as above Elliott wrote, "from the circumstance of its being eaten by negroes I had called it *V. esculenta;* it is, however, the *V. heterophylla* of Muhlenberg." This later name was adopted by LeConte, but his water-color, which I have seen, is unmistakably what is now considered *V. esculenta* Ell. Moreover, *V. heterophylla* is invalidated by two earlier uses of the name.

But whatever be the fate of the name, the epithet "heterophyllous" is quite applicable to the species, its leaves being sometimes pedately lobed, cleft or divided, and sometimes merely dentate.

The species is found in river-swamps and on wet borders of slow streams in the coastal plain from South Carolina to Florida, Mobile, Ala., Mississippi City, Miss., seen in National Herbarium, coll. Mohr. It is represented in my Distribution of Eastern North American Violets, 1910, by Nos. 49, 50 and 51.

The line-drawing is of a herbarium specimen from Jacksonville, Fla., Brainerd, coll., March 21, 1909.

Species No. 7—Viola latiuscula Greene

Viola latiuscula Greene, Pitt. 5: 93. Nov., 1902. Species No. 7.

The type was collected by Eggleston in open, shady, well-drained soil on the lower slopes of Twin Mountains, West Rutland, Vt., May 24, and July 15, 1902. At the close of 1903 it had been found in several other stations in western New England and adjacent New York. In 1910 specimens were sent in from western New York and northern Pennsylvania. It is Nos. 75 and 76 of my Distribution of 1910. The line-drawing was made from a water-color painted May 15, 1915, of a herbarium specimen from the type station. Greene's specific name was suggested by its broad, uncut foliage.

Species No. 8—**Viola rosacea** Brainerd

Viola rosacea Brainerd, Bull. Torr. Cl. 37: 525. Nov., 1910. Species No. 8.

This species has uncut, broadly cordate leaves, sparsely hirtellous above; corolla rose-purple about 2 cm. broad, auricles of the three outer sepals short and rounded; seeds buff. Specimens have been collected only at Point Saint Martin near Biloxi on the coast of southern Mississippi and at Crowley, La., and adjacent townships, but may be looked for at intermediate points. Its habitat is dry, open woodland above the bayous.

The line-drawing is based on a herbarium specimen from Crowley, La., Brainerd, coll., March 25, 1910. Specimens from this station may be seen in my Distribution of Eastern North American Violets, 1910, No. 134; and from Biloxi, Miss., Nos. 132 and 133.

Species No. 9—**Viola missouriensis** Greene

Viola missouriensis Greene, Pitt. 4: 141. March, 1900. Species No. 9.

Greene's description is detailed and indicates the affinity of the species with *V. papilionacea* and *V. latiuscula,* but differing in having seeds buff instead of brown and in having secondary leaves with more or less concave margins. The species is abundant from central Illinois southwest through eastern Missouri, southeastern Kansas, along the boundary between Oklahoma and Arkansas, and into Texas at least as far south as New Braunfels, Comal County.

The line-drawing is based on a water-color painted May, 1915, from a plant received from B. F. Bush, Courtney, Mo., and grown at Middlebury, Vt. Specimens collected on flood plains of Arkansas River near Muskogee, Okla., March 31, 1908, and on flat land along Flower Creek near Fort Gibson may be seen in my Distribution of Eastern North American Violets, 1910, Nos. 81 and 82.

Viola floridana Brainerd, Bull. Torr. Cl. 37: 524. Nov., 1910. Species No. 10.

The species was first collected March 13, 1907, near Jacksonville, Fla., on an embankment for a street railway across a little marsh near Woodlawn Cemetery. In March and April, 1909, the plant was collected at several other stations near Jacksonville, and at widely separated stations in Volusia County—near the famous DeLeon Spring, on the shores of Lake Beresford, on the edge of a tilled field near Lake Munroe and in moist woodland near Deep Creek. In flower and fruit it resembles *V. esculenta,* but its constantly uncut leaves on erect petioles and its habitat in well-drained soil mark it as distinct.

A beautiful specimen, collected at Beaufort, S. C., April 8, 1916, by Mr. Charles F. Batchelder of Cambridge, Mass., was sent the writer, and at once while the flowers were still fresh was painted by Mathews, as shown in our color-plate. A mature capsule has been added from a Florida plant. Nos. 60 and 61, Distribution of 1910.

See color-plate, Species No. 10, opposite this page.

Species No. 5—**Viola papilionacea** Pursh

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Species No. 10—**Viola floridana** Brainerd

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Species No. 14—**Viola hirsutula** Brainerd

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Species No. 15—**Viola septentrionalis** Greene

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Species No. 11a—Viola Lovelliana Brainerd

Species No. 12a—Viola triloba Schwein.

Viola triloba Schwein., Am. Jour. Sci. 5: 57. April, 1822. Species No. 12, a.

The most northern known station is Orwell, Vt. Material from this station is to be seen in Nos. 166, 167 and 168 of my Distribution, 1910. From Vermont the species ranges southward along the Appalachian Mountains to Georgia and central Alabama, and east to the coast as far south as Florida.

In the publication above cited Schweinitz remarks: "With some diffidence I venture to propose this new species." This was apparently due to his having rarely observed it—"twice or thrice," he says, "in different years." LeConte, however, had clearly made out its specific distinctness from both *V. palmata* and *V. sororia,* and in his monograph of *Viola,* October, 1826, published it as *V. congener,* adding "to this I cannot avoid referring *V. triloba* of Schweinitz." But if the two names belong to the same species, the law of priority requires us to adopt the name proposed by Schweinitz.

Species No. 12b—**Viola triloba** Schwein. var. **dilatata** (Ell.) Brainerd

Viola triloba Schwein. var. **dilatata** (Ell.) Brainerd, Bull. Torr. Cl. 37: 586-8, pl. 36. Dec., 1910. Species No. 12, b.

V. palmata var. *dilatata* Ell. 1817.

V. falcata Greene, Pitt. 4: 3. Jan., 1899.

Little needs to be added to the detailed discussion in Bull. Torr. Cl. of this well marked and widely distributed variety of *V. triloba.*

Specimens of the plant may be found in four numbers of my Distribution of Eastern North American Violets, 1910, viz.:

No. 169, Crowley, La., March 23, 1910;

No. 170, Mansfield, La., March 28, 1910;

No. 171, Mena, Ark., March 31, 1910;

No. 172, Westville, Okla., April 7, 1910.

The line-drawing was based on a specimen in my Distribution of 1910, No. 171, above cited; but specimens at petaliferous flowering are often quite pubescent, and have more narrowly lobed leaves.

Species No. 13—**Viola sororia** Willd.

Viola sororia Willd., Enum. 263, pl. 72. 1809. Species No. 13.

Our line-drawing is a copy of plate 72, which well presents the characters of the species in respect to pubescence, shape and serration of leaf. It is strange that for 79 years, from 1818 to 1897, the plant was not known by its correct name. It is a species of wide distribution, occurring in moist meadows, shady ledges and dooryards from western Quebec and New England to Minnesota and south to North Carolina and Oklahoma. See Nos. 158-161, Distribution of 1910.

The confusion caused by Nuttall in his Genera of North American Plants in 1818, who supposed *V. sororia* to be a plant with leaves pubescent only above, described in Rhod. 9: 98, June, 1907, as *V. hirsutula,* is discussed under that species, No. 14. We may, however, call attention to three synonyms published by Greene:

1. *V. cuspidata* Greene, Pitt. 3: 314. May, 1898. The material for this species was from Rock County, Wis. The description points plainly to *V. sororia* Willd.
2. *V. Dicksonii* Greene, Pitt. 4: 65. July, 1899. "A common Canadian Violet," further discussed in Pitt. 5: 63, Nov., 1902, as having baccate fruit, citing specimens from Vermont and elsewhere.
3. *V. nodosa* Greene, Pitt. 4: 296. Sept., 1901. From near Syracuse, N. Y., from H. D. House "related to such species as *V. cuspidata* and *V. Dicksonii.*"

Viola hirsutula Brainerd, Rhod. 9: 98. 1907. Species No. 14.

This species is readily distinguished from all other stemless violets by having leaves pubescent above but glabrous beneath. It is common from Bridgeport, Conn., southwest to Washington, western North Carolina, Augusta, Ga., and to Auburn, Lee Co., Ala. See Nos. 64 and 65, Distribution of 1910. For many years it passed as *V. villosa* Walter or as *V. sororia* Willd., owing to errors made by Nuttall in his Genera of North American Plants, 1: 148. 1818.

1. He supposed the plant with leaves pubescent only above to be *V. villosa* Walter (1788).

2. He held *V. sororia* Willd. (1809) to be only a later name for this hirsutulous *pseudo-villosa.*

He thus virtually combined *V. hirsutula, V. sororia* and *V. villosa* into one and the same species.

Against the former error LeConte in 1826 vigorously and justly protested: "When *V. villosa* is misunderstood it is simply by those who have never seen it." His water-color, labelled *V. villosa* Walt., correctly represents that species. But this misconception of *V. villosa* as an hirsutulous plant long survived. In 1898, Greene wrote, "the accepted *V. villosa* is not villous. It is rather stiffly hirsutulous"; and 14 months later he gave a new name (*V. carolina*) to the genuine *V. villosa* of Walter.

LeConte, however, in 1826, adopted Nuttall's second error and held Willdenow's *V. sororia* to be the plant with hirsutulous leaves, as is positively proved by his water-color labelled *"V. sororia."* This error continued in American botany nearly as long as did the other, and in fact led to the disuse of the specific name *"sororia"* for 79 years.

This confusion was probably due in part to a palpable blunder in Willdenow's description, in that he called the spurred petal bearded and the two lateral petals smooth. I say "palpable" blunder, for there is not a known violet in North America that bears such a flower. Willdenow's plate, No. 72[1] was of a plant grown indoors in a pot.

[1] See line drawing 13.

When grown in the open he says the petioles are a little shorter and the petals broader. He named it *"sororia"*—the sister violet—because of a fancied resemblance to the sweet violet, adding at the close of his formal description "stamens and remaining parts as in *V. odorata.*"

Britton was the first to arrive at a correct conception of Willdenow's *V. sororia,* apparently from a careful study of that author's plate 72,[1] to which Britton's fig. 2489[2] bears a close resemblance. But he seems to have been still uncertain regarding Walter's *V. villosa.* His fig. 2488, just preceding that of *V. sororia,* and his description are manifestly of the hirsutulous plant. Moreover, Pollard, in the Britton Man., 1901, and in Small's Southern Flora, 1903, presents the same misconception of *V. villosa* Walt. The following summary of the synonymy will help to clear up this confusion:

V. villosa Walt., Fl. Carol., p. 219. 1788.

V. sororia Nutt., *not* Willd. 1818.

V. hirsutula Brainerd, Rhod. 9: 98. 1907.

V. villosa Nutt., *not* Walter. 1818.

The most serious phase of this misconception remains to be presented. In 1901, seven years before the publication of *V. hirsutula,* Wilhelm Becker, a violet specialist of Germany, author of "Violae Europaeae" made a distribution of *Violae exsiccatae.* On a printed ticket his No. 36 purports to be

Viola villosa Walter, Fl. Carol., p. 219.
Pittonia, Vol. 3, p. 144.

Flora Americ. boreal: Marilandia; copiose ad "Forest Glenn" in collibus arenosis fl. May 7, fr. June 21, 1900.
leg. Th. Holm.

[1] See line-drawing 13.
[2] Ill. Fl. 2: 448, 1st ed. 1897.

Forest Glen is just north of Washington. The nearest known station for *V. villosa* Walter is Williamsburg, James City Co., Va., 90 miles farther south, and the specimens, a sheet of which is before me, are *Viola hirsutula* Brainerd.

It is surely distressing to learn that now for 20 years *V. hirsutula* has appeared in European herbaria as the *V. villosa* of Thomas Walter —the gifted English botanist, who before the American Revolution settled in South Carolina, studied and cultivated most of the thousand plants published in his Flora Caroliniana (1788), and, when he died a few weeks later at the early age of 48, desired to be buried in his garden among the plants that he so fondly loved.[1]

[1] See "A Visit to the Grave of Thomas Walter." Bull. Charleston Museum 3, No. 4. April, 1907; and Rhodora 9: 96-8. June, 1907.

See color-plate, Species No. 14, opposite page 33.

Viola septentrionalis Greene, Pitt. 3: 334. Sept., 1898. Species No. 15.

In January, 1896, Greene left the University of California to take the chair of Botany in the Catholic University at Washington. He found the region classic ground for violets, where the older American authorities—Pursh, Nuttall, Schweinitz and LeConte—had studied the genus. But there were two northern species which it was Greene's privilege to recognize and describe.

The type of *V. septentrionalis* was collected in rich soil along the border of thickets near Ottawa, Ont., by J. M. Macoun in 1898. A character by which the species may be readily distinguished is the fine and close ciliation of the sepals extending from the lengthened auricles to the very tip of the sepal. See Nos. 154, 155 and 156, Distribution of 1910.

In the Champlain Valley and in the Berkshire Hills of Massachusetts the species abounds on gravelly soil in partial shade; especially in open groves of arbor-vitae on ledges. It is not rare in the Penobscot Valley and along the coast of Maine. The general range of the species is from Newfoundland, Sable Island and Prince Edward Island, west to Ottawa and south through New England to Connecticut and northern Pennsylvania. It has also been found at two stations 20 miles apart on the south line of British Columbia[1] and may be looked for at intermediate points. The following four species proposed by Greene we regard as synonyms of *V. septentrionalis:*

1. *V. Macounii,* Pitt. 3: 335. Sept., 1898.
2. *V. subviscosa,* Pitt. 4. 293, Aylmer, Que. Sept., 1901.
3. *V. Fletcheri,* Pitt. 4: 296, Ottawa, Que. Sept., 1901.
4. *V. nesiotica,* Pitt. 5: 102, Prince Edward Island. Nov., 1902.

Following the last named species is *V. melissaefolia* Greene from Prince Edward Island that proved later to be *V. cucullata* × *septentrionalis,* a violet of remarkable beauty.[2] On the same page he reports having received an aestival specimen of *V. Dicksonii* that bears an underground fruit like a berry—"globose, as large as an ordinary wild gooseberry, absolutely indehiscent." This was later discovered to be a malformation caused by the sting of a gall-fly.

[1] Rhodora 17: 70. March, 1913.
[2] Rhodora 6: 220. Nov., 1904.
See color-plate, Species No. 15, opposite page 32.

Species No. 16—**Viola novae-angliae** House

Viola novae-angliae House, Rhod. 6: 226, pl. 59. Nov., 1904. Species **No. 16.**

The type of *V. novae-angliae* was collected by Fernald (No. 2245) at Fort Kent, Aroostook Co., Me., June 15, 1898. Three days later he collected another specimen at Saint Francis (No. 2244). Both collections were from the headwaters of the Saint John, on the northern boundary of Maine. Pollard determined these specimens as *V. emarginata,* the most northern station for which is southern New York.

In February, 1904, Fernald on sending me duplicates wrote: "I can not believe that the little plant of Fort Kent and Saint Francis has much to do with the southern species. I have always been confident that it represented a thoroughly distinct species. I shall be glad to have you describe the plant if you, too, feel that it is quite distinct." To secure mature specimens he went to the trouble and expense of a journey to Saint Francis, July 7, 1904, and had the live plant reproduced in a water-color, exhibiting the capsules of both petaliferous and cleistogamous flowers.

But while this investigation was in progress House described and figured the species from the flowering specimen sent Pollard, citing in addition to the two specimens from northern Maine, supposed specimens from three other stations: (1) A plant from Orono, Me., oddly enough described and figured in the same number of Rhodora[1] as *V. fimbriatula* × *septentrionalis*. (2) Another hybrid, *V. cucullata* × *fimbriatula*[2] from Bridgeport, Conn., 500 miles southwest of northern Maine. (3) Seedlings of *V. fimbriatula* from the Blue Hills reservation near Boston, Mass.

It is interesting to note what subsequent collections have revealed regarding the range of this near ally of *V. septentrionalis*, the "northern violet." In 1904 I received from Dr. Fletcher of Ottawa, five plants collected at Maple Lake near Parry Sound, Ont., about lat. 45° 20′. In June, 1909, Dr. H. V. Ogden of Milwaukee, Wis., sent live plants from Mercer,[3] Wis., lat. 46° 15′ and the year following other plants from Wild Rose and Saxeville, Wis., 250 miles farther south. Fernald received a specimen from Isle Royal in Lake Superior, Cooper Coll., Aug. 18, 1910, lat. 47°.

To the east of the type station I have received specimens from Saint George, Charlotte Co., N. B., lat. 45° 10′, J. Vroom coll., July and August, 1883, the earliest known collection. And lastly, it was found in lat. 44° 50′ on the rocky banks of the Penobscot, Veazie, Me., by O. W. Knight, June, 1905. See Rhod. 15: 113. June, 1913.

Our line-drawing is based on specimens transplanted from Wisconsin and grown in Middlebury, Vt.

[1] Rhod. 6: 215, pl. 58, fig. a. Nov., 1904.
[2] Rhod. 6: 217-8 and 7: 3.
[3] From seeds of this many plants were raised in 1910. Specimens collected May 15 and August 26, were distributed as No. 89 in my Distribution of Eastern North American Violets, 1910.

Species No. 17—**Viola affinis** LeConte

Viola affinis LeConte, Ann. N. Y. Lyc. 2: 138. 1826. Species No. 17.

V. venustula Greene, Pitt. 3: 335. Sept., 1898.

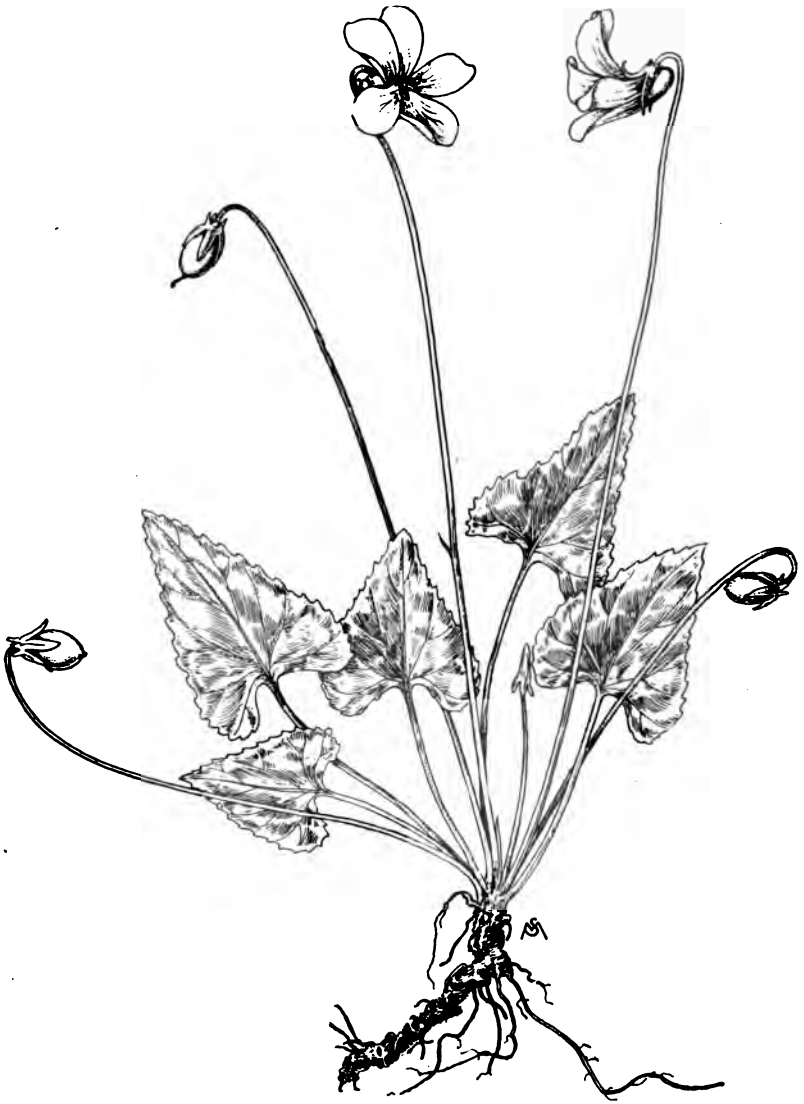
V. crenulata Greene, Pitt. 4: 295. Sept., 1901.

This species was named *"affinis"* because LeConte considered it of near affinity to *V. cucullata.* "I can find," he says, "no distinctive characters except the shorter peduncle and the broader sepals." But his description and his water-color, which was once shown me by Greene, prove that LeConte's species has been correctly understood. In Pitt. 3: 337, Sept., 1898, Greene so determines a specimen collected by James Macoun at Billings' Bridge, Ont. But on the previous page of this same paper Greene published his *V. venustula,* found in a wet meadow near Rideau Hall, Ottawa, Ont., by Macoun, May 23, 1898. I visited this station with Fletcher, September 3, 1904, and was convinced that the plant *"V. affinis,"* common in the District of Columbia, was identical not only with the plant of Billings' Bridge, but also with the *V. venustula* of Rideau Hall, and with plants of frequent occurrence in western Vermont.

In December, 1902, I sent specimens from Middlebury, Vt., to Greene as his *V. venustula* and with some hesitance he consented that Pollard should distribute them under that name.

The habitat of *V. affinis,* as now understood, is moist meadows, low woods and shady borders of streams, and its range is from western New England west to Wisconsin and south to Georgia and Alabama. It is represented by Nos. 1 to 6 in my Distribution of Eastern North American Violets, 1910.

The line-drawing is based on herbarium specimens from western Vermont.



Species No. 18—**Viola Langloisii** Greene

Viola Langloisii Greene, Pitt. 3: 87. June, 1896. Species No. 18.

This species is closely related to *V. affinis* LeConte. A good mark of distinction is found in the lengthened auricles of the sepals in *V. Langloisii* and in that it often exhibits a form with 3-5 pedately lobed leaves. Its habitat is wet, often flooded, borders of bayous, its range from Manatee, Fla., to San Antonio, Tex. The type was collected at Pointe Ci la Hache, near the mouth of the Mississippi River, as I learn from a sheet of the original material kindly presented me by Greene.

The line-drawing is of a herbarium specimen from Crowley, La., Brainerd, coll., March 19, 1908. The species is to be seen in Nos. 72, 73 and 74 of my Distribution of Eastern North American Violets, 1910.

Species No. 19—**Viola chalcosperma** Brainerd

Viola chalcosperma Brainerd, Bull. Torr. Cl. 37: 523-4. Nov., 1910. Species No. 19.

This species has been found as yet in only one station—a wet, wooded ravine in Jacksonville, Fla. An expert collector will doubtless find it in similar places in northeastern Florida. The species is well marked by its seeds, which have the color of old bronze, a character which suggested the name of the species. The leaves in early spring when the petaliferous flowers appear are cordate and 3-lobed, the middle lobe ovate and acute, the lateral lobes more or less incised, the later leaves broadly deltoid, twice as long and but slightly lobed, at least when grown in the North; the petals are lilac-purple, the cleistogamous flowers sagittate; the sepals 5 mm. long, the auricles 3-4 mm. long.

My first acquaintance with the species was in the summer of 1907, when Miss A. M. Ryon of New London, Conn., sent me live plants collected the preceding March at Jacksonville by Mrs. E. K. Comstock. Guided by Mrs. Comstock's precise directions I readily found the station on a trip to Florida in March, 1909.

Specimens appear in Nos. 25 and 26 of my Distribution, 1910.

The line-drawing is of a herbarium specimen from Jacksonville, Fla., Brainerd, coll., March 21, 1909.

Viola nephrophylla Greene, Pitt. 3: 144-5. 1896. Species No. 20.

The type of this species was collected by Greene "in dry thickets in the valley of the Cimarron River, western Colorado, August 29, 1896." The mounted sheet consists of 14 plants bearing numerous cleistogamous capsules in various stages of development, and occasional reduced petaliferous flowers on pedicles 2-4 cm. long, such as in early autumn are not rarely found in this and other species of *Viola*. For several years afterward the plant was often collected, but vaguely understood. Greene in 1899 examined a specimen from Hull, Que., collected by Macoun, but failing to identify it with the defective Colorado type he gave it another name *V. vagula*.[1] Unlike the Colorado specimen this was in full bloom and described in detail so exactly that I thought it to be probably what Fernald was finding in Quebec and Maine, and others at four different stations in Vermont. To remove all doubt I visited Ottawa, September, 1904, and found *V. vagula* to be identical with the plants from Maine and Vermont, and with the type of *V. nephrophylla* which Greene had kindly sent me for examination.

Probably no North America violet has a wider range—from Newfoundland and Gaspe County, Que., south to Litchfield, Conn., and west along the Great Lakes and the Canadian border to eastern Washington; detouring southward along the Rocky Mountains to Colorado and Utah, and from the eastern slopes of the Cascade Mountains to the northwest border of California. Eggleston collected it also in two counties of Arizona, Cochise and Coconino, and in the mountains of New Mexico south to the middle fork of Gila River, Grant County.

[1] Pitt. 4: 67. July 7, 1899.

See color-plate, Species No. 20, opposite page 64.

Our color-plate is based upon a plant from the most southerly known station in California. It was collected by Mrs. Viola Brainerd Baird on July 12, 1915, at Lake Donner—a name commemorating the tragic fate of a large family of immigrants, who in 1849 were belated and perished here in the winter snows, often from 15 to 20 feet deep in the passes of the Sierra Nevada. The lake may be seen from the railway train as one is descending the eastern slope of the mountain. See specimens Nos. 81-86 of my Distribution, 1910.

The synonymy may be summed up as follows:

V. nephrophylla Greene, Pitt. 3: 144-5. Dec. 16, 1896. S. W. Colorado.

V. cognata Greene, Pitt. 3: 145. Dec. 16, 1896. S. Wyoming.

V. vagula Greene, Pitt. 4: 67. July 7, 1899. Hull, Que., opposite Ottawa.

V. Austinae, Greene, Pitt. 5: 30. Sept. 9, 1902. Plumas County Cal. and Lassen County, Cal. Mrs. Austin, M. S. Baker.

V. galacifolia Greene, Pitt. 5: 30. Sept. 9, 1902. Eastern Oregon. Cusick, May 30, 1898.

V. subjuncta Greene, Pitt. 5: 31. Sept. 9, 1902. Whitman County, Wash. C. V. Piper, 1898.

V. arizonica Greene, Pitt. 5: 33. Sept. 18, 1902. Post Spring, Fort Verde, Ariz. Dr. E. A. Mearns, April, 1888.

Species No. 21—**Viola cucullata** Ait.

Viola cucullata Ait., Hort. Kew. 3: 288. 1789. Species No. 21.

The nomenclature of this species was much confused for about a century. There is hardly any decisive character in Aiton's Latin diagnosis except that the lateral petals are longer than the spurred petal. Schweinitz in 1822[1] gives a detailed and exact account of the species, but unfortunately under the name *V. obliqua* Ait. LeConte in 1826[2] correctly described and figured it, but included under it as varieties *V. papilionacea* Pursh, and *V. sororia* Willd. I have before me tracings of his water-colors of these three species. In Gray's last publication on *Viola*[3] he says, "*V. cucullata* Ait. ought to have been referred as an entire-leaved variety to the Linnaean *V. palmata*"; and it so appears in the Synoptical Flora, and in the sixth edition of the Gray Man., p. 79, 1890.

In 1896, Greene took up the study of the eastern violets. In December of that year he described specimens from Ellicott City, Md., collected May 3 and 24, 1896, as *V. cucullata* Ait. probably. In September, 1898, he stated that his former doubts had "been banished." By November, 1902, he had concluded that the bog meadow violet that he had been calling *V. cucullata* was an aggregate of several clearly distinguishable species, and he proceeded to describe and name five new ones.[4] During these six years I was in frequent correspondence and exchange of specimens with him, though not in sympathy with his growing disposition to split species. After 1902 evidence rapidly accumulated regarding the specific and varietal characters, the habitat, and the wide range of *V. cucullata,* and in these matters there has been of late years a general consensus of opinion. A few additional facts, may, however, be stated. The species often bears petaliferous flowers in autumn with notably long auricles. Its cleistogamous flowers are very characteristic—long and slender on erect, often elongate, peduncles. Its habitat is cold bogs and springs, and it is frequently found near the top of our highest mountains. Its range is from Quebec and Ontario to northeastern Georgia; and recently a straggling specimen has been seen in the Bronx Park herbarium collected in swamps, Moark, Ark., B. F. Bush, No. 3755, October 18, 1905.

Our line-drawing is of a plant from the summit of Mount Mansfield just below the hotel, altitude 4,000 feet, July 4, 1906. See specimens No. 32 and No. 33 of my Distribution of Eastern North American Violets, 1910.

[1] Am. Jour. Sci. 5: 60-1. April, 1822.
[2] Ann. Lyc. N. Y. 2: 137. 1826.
[3] Bot. Gaz. 11: 254. Nov., 1886.
[4] Pitt. 3: 143. Dec., 1896; 3: 336. Sept., 1898; and 5: 96-101. Nov., 1902.

Species No. 22a—**Viola viarum** Pollard

Species No. 22b—**Viola viarum** Pollard

Species No. 23b—**Viola villosa** Walter

Viola viarum Pollard, Britton Man., p. 635. 1901. Species No. 22.

The type was collected along railroads in dry soil, St. Louis, Mo., by J. B. S. Norton, July 15, 1899, and specimens of the original collection were distributed from the National Herbarium as No. 32 of North American Violaceae. In August, 1905, the plant was collected at Eagle Rock, Mo., B. F. Bush, No. 3144, and sent me unnamed. From its seeds specimens were grown at Middlebury, Vt., where the plant has since persisted without special care. It was sent out as Nos. 75 and 176 of my Distribution of Violets, 1910. Mr. Bush wrote that the plant was very common along the rocky banks of the White River, which flows southeastwardly for over 100 miles through the Ozark Hills of northern Arkansas. The specimen cited for Oklahoma by Pollard in the Britton Man., page 636, proves to have been *V. papilionacea* × *pedatifida*. The species is reported from Knox County, Ind.

The leaves of *V. viarum* are heterophyllous—some undivided (merely serrate), others pedately 3-7-lobed or parted; the flowers are purplish, the spurred-petal glabrous, the upper pair broader, divergent, emarginate; the seeds dark brown, 2 mm. long.

The line-drawings (pages 58-59) are based on herbarium specimens ex horto grown from the Eagle Rock material. See Nos. 175 and 176, Distribution of 1910.

Viola villosa Walter, Fl. Car., p. 219. 1788. Species No. 23.
V. carolina Greene, Pitt. 3: 259. Feb., 1908.

Walter's brief description is as follows: "Acaulis, foliis cordato-ovatis villosis, floribus aliquando caeruleis aliquando apetalis."

Greene pronounces this species "no better than a *nomen nudum*. Every one of the descriptive terms that author uses will apply equally well to every other one of our blue-flowered, stemless violets that is not glabrous." But after repeated visits to the tide-water plains of South Carolina where Walter lived, we are confident that no other violet in those flat, sand plains answers to his concise description: stemless, leaves villous cordate-ovate, flowers at times blue, at times apetalous.

Elliott in his Botany of South Carolina and Georgia, p. 297, 1817, is more exact than Walter, noting that the species is very downy rather than villous, the flowers pale-blue and that it grows in dry, sandy soil. Nevertheless, a year later came the misconceptions of Nuttall regarding *V. villosa* and *V. sororia* already discussed under *V. hirsutula*.

The two line-drawings were made from herbarium specimens. The upper showing fruit was collected at Gilmerton, Va., by House, April, 1913; the lower at Auburn, Ala., by Baker, March 18, 1898.

See also color-plate, Species No. 23, opposite page 64.

Species No. 24—**Viola fimbriatula** J. E. Smith

Viola fimbriatula J. E. Smith, Rees' Cycloped. 37, No. 16. 1817. Species No. 24.

The confluence of *V. fimbriatula* and *V. sagittata* was set forth in Rhod. 8: 57, pl. 68. March, 1906; and on the following page, between *V. emarginata* and *V. sagittata;* and between *V. emarginata* and *V. fimbriatula.* Observations during the subsequent 15 years have abundantly confirmed these conclusions.

At the same time these aberrant forms ought not in our manuals to divert attention from the normal forms which occur far more frequently in nature. In foliage the three pure species differ as follows:

Leaves pubescent, mostly short-petioled, ovate-oblong, only crenate-serrate at base, *V. fimbriatula.*

Leaves glabrous, rather long-petioled:

(a) Lanceolate at base, often dilated and incised, *V. sagittata.*

(b) Deltoid at base, coarsely dentate, *V. emarginata.*

In my Distribution of Eastern North American Violets, 1910, the following numbers illustrate some of the varying forms of the three species under discussion: *V. emarginata* 45-48; *V. fimbriatula* 52-55; *V. sagittata* 139-141.

Viola sagittata Ait., Hort. Kew. 3: 287. 1789. Species No. 25.

This species has been much confused with its allies *V. emarginata* and *V. fimbriatula* as will appear from the following list of their synonyms.

V. sagittata Ait. 1789.

V. dentata Pursh. 1814.

V. sagittata var. *emarginata* Nutt. 1818.

V. emarginata (Nutt.) LeConte. 1826.

V. fimbriatula J. E. Smith. 1817.

V. sagittata Pursh, "dry hills" not Aiton. Probably *V. fimbriatula* × *sagittata*.

V. primulifolia Pursh, not L.

V. ovata Nutt. 1818.

The range of *V. sagittata* is remarkably wide, from eastern Massachusetts south to Louisiana and west into the region of the Great Lakes. The species is also noticeably inconstant as respects pubescence. In the North and West this may be due in part to its interbreeding with *V. fimbriatula*. Philip Dowell reports[1] that "where the two species grow together it is difficult to find the pure species unmixed." But it is also in accord with the general law that low temperature and high humidity favor pubescence, while high temperature and low humidity tend to do the opposite. In other words, under hot, dry, sunny conditions plants are usually less pubescent than under

Species No. 20—**Viola nephrophylla** Greene

UNIV. OF
CALIFORNIA

Species No. 23a—**Viola villosa** Walter

Species No. 25—Viola sagittata Ait.

UNIV. OF CALIFORNIA

Species No. 27—**Viola Brittoniana** Pollard

No Image
Available

cool, moist, shady conditions. This is well shown in our two line-drawings of *V. palmata* L., species No. 2, the northern plant from the Berkshire Hills of Massachusetts being markedly villous, the Florida plant almost glabrous. But it is illustrated equally well in *V. sagittata.* In the South the species is habitually glabrous; in the region of the Great Lakes the prevalent form is pubescent and was named *V. subsagittata* by Greene,[2] but the habitat is usually wet meadows or swales or cool shores at the south end of Lake Michigan or Lake Huron.

Gray's final statement regarding *V. sagittata* is significant: "generally well marked as this is, yet it appears to be confluent on one hand into typical *V. palmata,* on other into the var. *cucullata;*"[3]—that is, into a variety of *V. palmata* as var. *cucullata* is regarded in Manual, 6th ed., 1890, probably *V. papilionacea* as now understood. This indicates that he was influenced in his reduction of violet species by his knowledge of the numerous intergrading forms that connect the extreme types of the *"cucullata-sagittata"* group. Whether he considered this due to recent interbreeding or did not, it would support his conception of "var. *cucullata*" as "most polymorphous."[4]

[1] Bull. Torr. Club 37: 175. April, 1910.
[2] Pitt. 3: 315. May, 1898.
[3] Bot. Gaz. 11: 254. Nov., 1886.
[4] Synoptical Fl., p. 196. 1895.

See color-plate, Species No. 25, opposite page 65.

Species No. 26a—**Viola emarginata** (Nutt.) LeConte

Viola emarginata (Nutt.) LeConte, Ann. Lyc. N. Y. 2: 142. 1826. Species No. 26.

The close relationship between this and the last two species and their frequent confluence has been stated under *V. fimbriatula.*

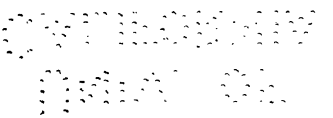
V. emarginata was first recognized by Nuttall in his Gen. N. Am. Pl. 1:147, 1818, as a variety of *V. sagittata.* In 1826 Leconte as above cited published it as a species. He remarks: "Found in dry woods from New Jersey to Carolina; it has no resemblance to *V. sagittata,* and may be recognized at first sight by its larger diversiform leaves and larger flowers." On April 1, 1907, Greene showed me Le Conte's water-color of this species, which tallies well with a form that I have collected at many stations in the Carolinas and Oklahoma. This is less deltoid than the form found north of southern Virginia, and the notched petals that suggested Nuttall's original name, "emarginata," are lacking. See 45, 46 and 47 of my Distribution, 1910.

See line-drawing, page 66, based on a plant of the Northeastern United States; and line drawing, page 68, based on a herbarium specimen ex horto, Aug. 30, 1911, transplanted from Oklahoma.

Species No. 26b—**Viola emarginata** (Nutt.) LeConte

Species No. 29—**Viola septemloba** LeConte

Species No. 30—**Viola Selkirkii Pursh**



Species No. 32—**Viola renifolia** Gray

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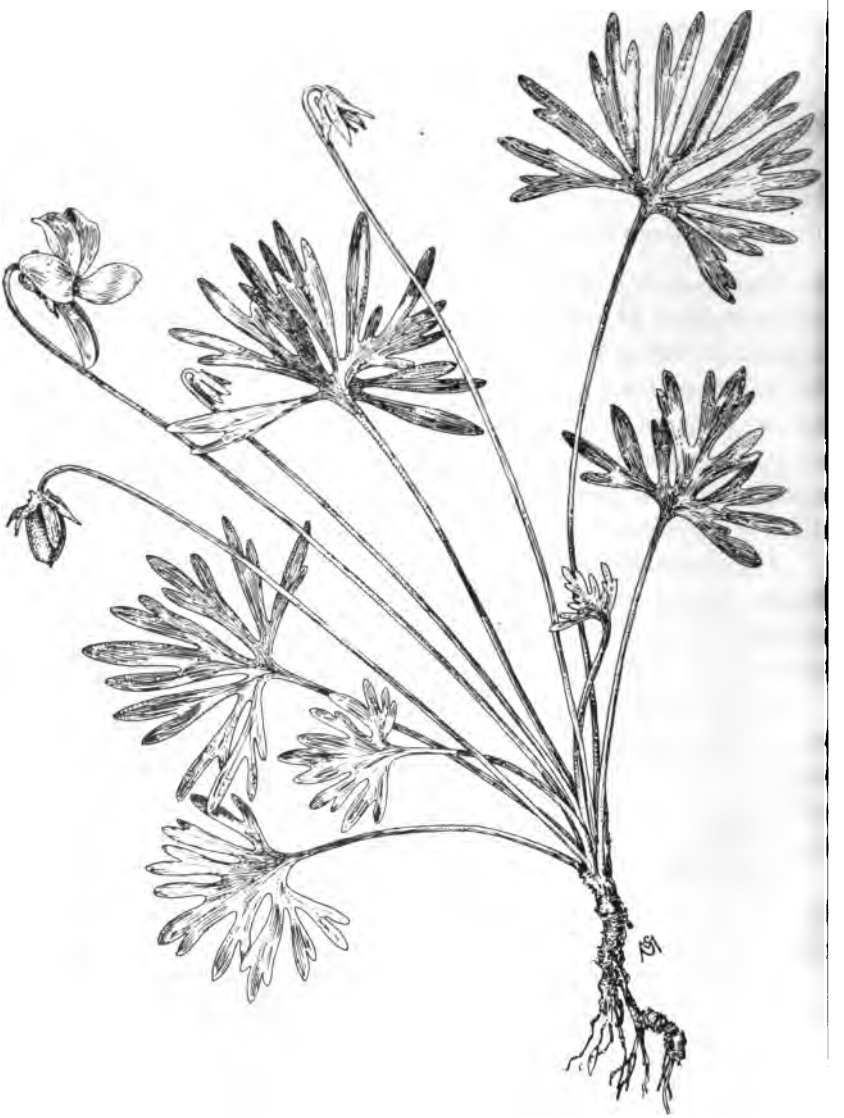
Species No. 35—**Viola pallens** (Banks) Brainerd

iola Brittoniana Pollard, Bot. Gaz. 26: 332. 1898. Species No. 27.

This species was first recognized by Britton and published in the orrey Bulletin 24: 92, 1897, and about the same time in the Britton's l. Flora 2: 446 as *V. atlantica*. It was soon discovered that the name id been used for a European species by Pomel in 1874; and Pollard id the pleasure of publishing the American plant as *V. Brittoniana*. Ve present a color-plate of this attractive species, found in peaty or ioist, sandy soil along the coast from Maine to Virginia. See also lo. 17 of my Distribution, 1910.

Associated with this species is usually found an allied plant appro-riately named *"pectinata"* by Mr. Bicknell[1] from the long, narrow, omb-like incisions of the leaf-blade. In all other characters—in flower nd fruit, in fertility, in size and color of seeds and in rootstock—ie plant is identical with typical *V. Brittoniana*.[2] It appears to be a ase of dimorphism not infrequent in *Viola* and is discussed in our ccount of *V. hastata* Mich., species No. 54.

[1] Torreya 4: 129. 1904.
[2] See Rhod. 8: 59, pl. 69. March, 1906; where for *V. septemloba* read *V. Brit-oniana*. See No. 115 Brainerd's Distrib. of Viola, 1910.
See color-plate, Species No. 27, opposite page 65.



Species No. 28—**Viola pedatifida** Don

Viola pedatifida Don, General System, Gard. Dict. 1: 320. 1831. Species No. 28.

V. delphinifolia Nutt. in Torr. & Gray, Fl. No. Am. 1: 136. 1838.

About two years before his death, January 30, 1888, Gray in the Bot. Gaz. 11: 254, Nov., 1886, said of *V. pedatifida* Don.: "Its affinities are with *V. palmata,* indeed [it] is probably only a marked geographical variety of that species." But in the Synop. Fl., p. 196, Oct., 1895, it is admitted without comment between *V. pedata* and *V. palmata.* In the paper above cited Gray speaks of specimens collected at Concord, Mass., by Tuckerman "which would surely pass for *V. pedatifida* if from the valley of the Mississippi." They were doubtless *V. Brittoniana* and its associated *V. pectinata.*

V. pedatifida is a species of the Atlantic Basin, also abundant in the prairies of the Middle West, ranging from near Sandusky, Ohio, northwest to Saskatchewan and southwest to Oklahoma and New Mexico.

The name is singularly inappropriate, for the middle segment of the leaf is always dissected, while in the strictly pedate leaf it is never dissected. The blade of *V. pedatifida* is primarily 3-parted, and when well developed each of the three segments is further trisected, and then each of these subdivisions once more cut into 2-4 lobes.[1]

Our line-drawing is of a herbarium specimen from prairie near Muskogee, Okla., Brainerd, coll., April 11, 1910. The species is No. 120 of my Distribution of Eastern North American Violets, 1910.

[1] See pl. 1, fig. 2, Bull. Torr. Cl. 38. Jan., 1911—a leaf-blade having in all some 30 incisions.

Viola septemloba LeConte, Annals N. Y. Lyceum 2: 141. 1826. Species No. 29.

This species is here well described and is said to grow in Carolina and Georgia only in pineries, through what is called the lowlands. "Its peduncles often eight inches high are adorned with flowers two inches in diameter." This statement is exactly borne out by his beautiful water-color, which the present writer had the privilege of examining when it was owned by Greene.

The treatment of *Viola* in Eaton's Botany, widely used till 1850, is hardly more than a translation of LeConte's monograph of 1826. But Torrey and Gray as early as 1838 in their Flora of North America say "we fear that this species (*V. septemloba*) is only a variety of *palmata*." In Gray's paper on *Viola* in 1886 it is called a "variety of *palmata*," and in the Synop. Fl., Oct., 1895, it is simply cited as synonym of *V. palmata*. In the first edition of Small's Southern Flora in 1903, the plant at length regained recognition in American botany after suffering a well-nigh total eclipse for over half a century.

The present known range of the species is from southeastern Virginia to Florida, in the tide-water plain and west to Biloxi, Miss. The foliage of the plant is extremely variable. "The first leaves often, and sometimes all the leaves, uncut; the others primarily 3-lobed, 3-cleft or 3-parted with widely open sinus, the middle segment uncut, relatively long and broad, usually narrowed at the base, the lateral segments (sometimes uncut) but generally pedately cleft into 2-4 narrow divergent parts that become smaller toward the base of the leaf."[1]

V. septemloba has been often confused with *V. Brittoniana*, a cut-leaved species of the same group and of similar habitat. But they differ in three respects: (1) The seeds of *V. Brittoniana* are buff and 1.6 mm. long; those of *V. septemloba* are dark brown and 2 mm. long. On weighing 200 seeds of each, those of *V. septemloba* were found to be over 93 percent the heavier, or nearly twice as large. (2) The leaves of *V. Brittoniana* are palmately parted, all of the three primary segments being again twice or thrice split; those of *V. septemloba* are pedately parted. (3) *V. septemloba* is found only in southeastern Virginia and southward, *V. Brittoniana* only in Virginia and northward.

The color-plate of *V. septemloba* represents a pressed plant from a pine woods near Summerville, S. C., Brainerd coll., March 25, 1907, and is the copy of a water-color by Mathews. Specimens are to be seen in my Distribution, 1910, Nos. 150-153.

[1] Brainerd in Small's Southern Fl., 2nd ed. 1913.

See color-plate, Species No. 29, opposite page 68.

Viola Selkirkii Pursh, Goldie, Edinb. Phil. Jour. 6: 324. 1822. Species No. 30.

This, one of the most distinct of North American violets, was first discovered on hills about Montreal, Que., and described[1] by John Goldie, a Scotchman who collected plants in North America from 1817 to 1820. The violet seems to have been seen and named by Pursh, for in 1822 it was published in the Edinburgh Phil. Jour. (6: 324) as *"V. Selkirkii* Pursh, by Goldie." The Scotch collector in 1844 emigrated to Ayr, Ont., where he died June, 1886, at the age of 93. In a letter to Hooker,[2] Gray wrote, "Old Goldie, your father's correspondent lange syne, died only this summer, very old."

Stations for *V. Selkirkii* rapidly multiplied after Goldie's discovery. True to its name—after the sailor Alexander Selkirk, the Robinson Crusoe of Defoe—this violet dwells in the solitude of cold mountain forests, and is reported from as far north as Greenland. Gray discovered that the species was circumpolar, occurring in Russia, Japan and Kamtschatcha. Happily, the Eurasian plants were described later than 1822, and *V. Kamtschatica* Gingins and *V. umbrosa* Fries are only synonyms of *V. Selkirkii* Pursh.[3]

Some recent finds are interesting. The writer has a specimen collected by Prof. J. K. Henry, June 13, 1895, from low woods on terraces of the Skeena River, B. C., in lat. 55° 15′ N., long. 127° 41′ W. and from slopes of Mount Bonaparte, Okanógan County, Wash., Eggleston, 13055 and 13057. July, 1916. This is strongly confirmatory of Gray's opinion that many of our northwestern American plants have reached us from northern Asia across the Bering Sea, often migrating southward along the Rocky Mountains, even to Colorado, from which State I have received many specimens of *V. Selkirkii* and of *V. biflora* L. another Eurasian species.

Wilhelm Becker, a violet specialist places *V. palustris* and *V. Selkirkii* on the basis of their disk-form stigmas in a distinct group. The former is stoloniferous, the latter not. Furthermore, *V. Selkirkii*, very soon after petaliferous flowering, bears cleistogamous flowers in abundance.

The plant shown in our color-plate came from the mountains to the east of Middlebury, Vt., collected April 25, 1913. See also Nos. 148 and 149 of my Distribution, 1910.

[1] Dr. Gray, Bot. Gaz. 11: 254, 272. Nov., 1886.
[2] Sept., 1886. Letters of Asa Gray, p. 785.
[3] See Gray Man., ed. 5, p. 78. 1874.

See color-plate, Species No. 30, opposite page 68.

Species No. 31—**Viola palustris** L.

Viola palustris L. Sp. Pl. 934. 1753. Species No. 31.

The line-drawing is a copy of Reichenbach's Ic. Fl. Germ. iii. t. 2.

In Wilhelm Becker's Violae Europaeae *V. palustris* is associated with *V. Selkirkii,* both having a disk-form stigma produced into a short beak, but differing in that *V. palustris* has creeping stolons and *V. Selkirkii* does not.

As the specific name indicates the plant is a denizen of swamps or of cold, wet mountains. The species is widespread in the highlands of Europe and northern Asia, and is found in North America from Labrador to Alaska, extending southward in the east to the high mountains of New England, and in the west southward along the Rocky Mountains to Colorado, and along the Pacific Coast to Washington.

The foliage is glabrous; the petals pale violet or sometimes white.

Viola renifolia Gray, Proc. Am. Acad. 8: 288. 1870. Species No. 32.

Gray's paper reads as follows: *Viola renifolia,* n. sp. Rhizomate floribusque *V. blandae* vel paullo majore; foliis reniformibus (adultis saepius poll. 2 latis) utrinque cum petiolo villoso-pubescentibus; scapo pubescente.[1]

"This violet was first brought to my notice by Miss Shattuck of Mount Holyoke Seminary, who collected it at, or received it from, East Elba, New York. Later, Mr. Henry Gilman sent it from Ontonagon,[2] Lake Superior, and now I have fresh specimens and the living plant from Mr. Frank A. Sherman of Hanover, N. H. Also specimens from the colder parts of Oneida County, N. Y., from Professor Paine. It grows in company with *V. blanda,* which it closely resembles as to the flower, but the leaves are more like those of *V. palustris;* yet they are more strictly reniform and are conspicuously beset with pale, soft and tender, lax hairs."

To this Eggleston adds: I remember now Professor Jessup telling me that the type location for *V. renifolia* was the "Bottomless Pit in Hanover" (N. H.). Prof. Frank A. Sherman, my professor of mathematics, also told me * * that the "Bottomless Pit in Hanover is a great sphagnum bog that was a favorite botanizing place of ours."

In his final revision of *Viola*[3] Gray unites under *V. blanda* "two forms which in their extreme would seem specifically distinct, viz.: var. *palustriformis,* and 'var. *renifolia,*' which seems quite different from the ordinary state of *V. blanda* . . . . (but) is so connected with the preceding variety that it can not be kept distinct." Just how it is connected is not explained, but it was probably due to the unrecognized presence of two other good species, *V. incognita* and *V. pallens,* the latter surmised to be such by DeCandolle as early as 1824.[4] See Rhod. 7: 245-8. Dec., 1905.

A similar confusion and perplexity is to be seen in Greene's publication of *V. Brainerdii,*[5] "by no means," he says, "an easily differentiated segregate of *V. renifolia.*" Some of his material, No. 17 of Pollard's distribution and Watson's plant from Prince Edward Island, was *V. incognita*—the "unrecognized" masquerader that for many years was a hidden source of perplexity to the student of *Viola.*

[1] Rootstock and flowers of *V. blanda* or somewhat larger; leaves reniform (when full grown quite often 2 in. broad) on both surfaces and the petiole villous-pubescent; scape pubescent.
[2] In lat. 46° 49′, long. 89° 27′ W.
[3] Bot. Gaz. 11: 255. 1886.
[4] See under *V. pallens.* Prodromus 1: 295. 1824.
[5] Pitt. 5: 89-90. Nov., 1902.

The publication of *V. renifolia* Gray, var. *Brainerdii* (Greene) Fernald[1] speaks for itself; however, attention should be called to a name 13 years older, *V. mistassinica* Greene, Pitt. 4: 5. Jan., 1899. The types in the Herbarium of the Canadian Geological Survey are: No. 1, from damp, mossy woods about Lake Mistassinai, Quebec,[2] that empties into Hudson Bay; No. 2, from Hamilton River, Labrador; and No. 3, from the east shore of Hudson Bay, the last two stations being in about 55° north lat. With these should be cited a station near Hazelton on the Skeena River in northern British Columbia.[3] J. K. Henry coll., June 15, 1895, and a station at Golden, B. C., where the Canadian Pacific R. R. leaves the Columbia River to cross the Rocky Mountains, and from slopes of Mount Bonaparte, Okanógan County, Wash., Eggleston, 13056, July, 1916. These far northern plants have surely diverged in habitat and aspect a long way from the typical *V. renifolia* of Hanover, N. H. See Nos. 129, 130 and 131, Distribution of 1910.

V. renifolia differs from the two other woodland plants—*V. incognita* and *V. blanda,* its nearest allies—in three respects: (1) In its reniform leaves, (2) in the absence of stolons, (3) in having beardless petals. In these characters it approaches the purple-flowered species *V. Selkirkii* Pursh.

[1] Bull. Torr. Cl. 38: 8. Jan., 1911; and Rhod. 14: 86-8. May, 1912.
[2] Lat. 51° N.
[3] Lat. 55° N., Long. 128° W. Both specimens in Herb. E. B.
See color-plate, Species No. 32, opposite page 69.

Species No. 33—**Viola incognita** Brainerd

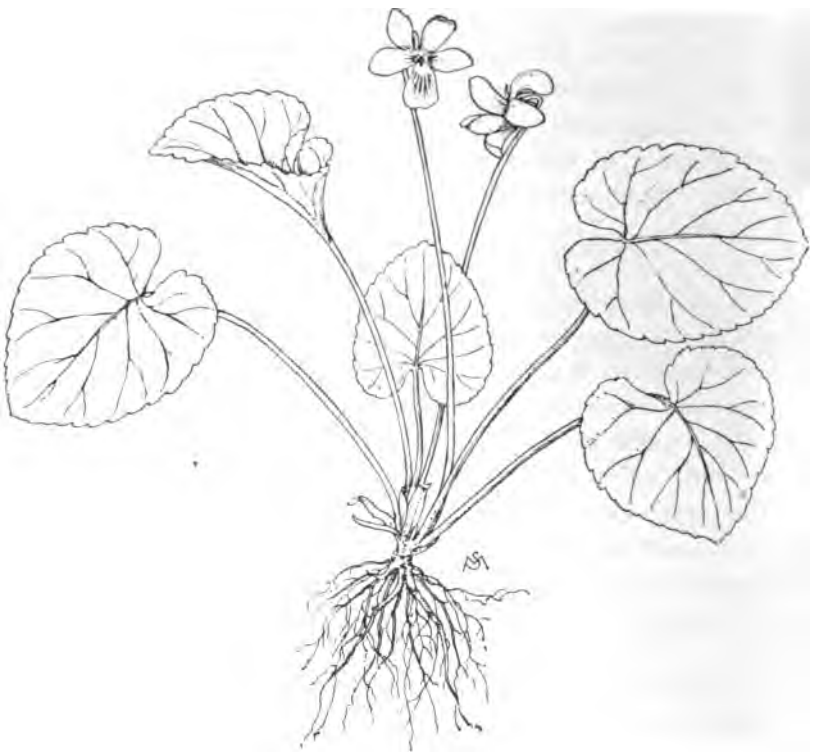
Viola incognita Brainerd, Rhod. 7: 248. Dec., 1905. Species No. 33.

The circumstances leading to the publication of this white violet are stated in the Rhodora article above cited. But the specific name has not always been understood. The word means not only unknown, but unrecognized. This abundant species, ranging from Newfoundland to the Dakotas and south to eastern Tennessee, had for many years been a source of confusion and perplexity, often playing the part of a masquerader and passing as one of the older species. A striking instance of this is to be seen in Greene's publication of *V. Brainerdii*,[1] "by no means," he says, "an easily differentiated segregate of *V. renifolia*." This was plainly due to the fact that some of his material, No. 17 of Pollard's Distribution and L. W. Watson's plant from Prince Edward Island, was *V. incognita*. Many specimens in my own and in other herbaria determined before 1905 as *V. amoena* LeConte, *V. blanda* Willd., or its var. *palustriformis* Gray, prove to be *V. incognita*, or var. *Forbesii* Brainerd, Bull. Torr. Cl. 38: 8-9, fig. 1, Jan., 1911, named for Mr. F. F. Forbes of Brookline, Mass., an accurate and critical student of *Viola*.

This approaches *V. blanda* Willd. as respects pubescence, probably as a result of vicinism in the more or less remote past; but in other respects it is like typical *V. incognita*. Its characters appear now for the most part stable and its stations are often quite remote from those of *V. blanda*. It is, however, not unlikely that some instances occur of recent hybridism. A suspected hybrid may be tested by raising from its cleistogamous seeds a brood of offspring, which, if reverting variously to the characters of the suspected grandparents, prove the hybrid nature of the parent. See Bull. Torr. Cl. 40: 249-260, plates 15, 16, 17, June, 1913, for examples of these experimental cultures.

This species is represented by Nos. 67, 68 and 69 of my Distribution, 1910.

[1] Pitt. 5: 89-90. Nov., 1902.



Species No. 34—**Viola blanda** Willd.

Viola blanda Willd., Hort. Berol., t. 24. 1806. Sp. No. 34.

Willdenow in his description emphasizes the fact that the lateral petals are beardless, stating it in three places; but he overlooks another important character, the minute white hairs on the upper surface of the leaves, calling them glabrous—"foliis glabris." His hand-colored plate, two copies of which I have examined and from which our line-drawing is made, is excellent. In this plate the peduncle, petiole and even the midrib have a pink color, often found in this species when growing in boggy soil, but rarely seen in *V. pallens*.

The medley of names wrongly used for *V. blanda* is best shown by a tabular list of the synonyms:

Viola blanda, Willd., Berol. t. 24. 1806.

V. amoena LeConte,[1] Ann. Lyc. N. Y. 2: 144. 1826; not Symons. 1798.

V. Leconteana Don, Gen. System. 1: 324. 1831.

V. alsophila Greene, Pitt. 4: 7. Jan., 1899.

The species is far less hardy than *V. pallens* and ascends to high altitudes only in the South. On shaded rocks in Tryon, N. C., forms occur in which the upper surface of the leaf is quite glabrous. The range of *V. blanda* is from western Quebec and western New England to Minnesota, and south in the Appalachian Mountains to Georgia. It is represented in Nos. 15 and 16 of my Distribution of Eastern North American Violets, 1910.

The line-drawing is a copy of Willdenow's t. 24, 1806.

[1] LeConte's *"V. blanda"* was the plant now considered *V. pallens*, as is shown both by his description and by his water-color labelled by him "blanda." Of this a tracing is before me; it is indubitably *V. pallens*.

Viola pallens (Banks) Brainerd, Rhod. 7: 247. Dec., 1905. Species No. 35.

This was originally described by DeCandolle[1] from herbarium specimens collected by Banks in Labrador several years earlier, bearing the manuscript name *"Viola rotundifolia* Mich. var. *pallens."* De Candolle's brief description is "glabra, sepalis acuminatis—in Labrador et Kamtschatka. In eadem ac alpha? An species?" which seems to mean that he doubts if it is Michaux's species and suspects that it is something else.

Only two years later (in 1826) LeConte in his monograph of *Viola* conceived the plant to be the *V. blanda* of Willdenow and used the name *V. amoena* for the true *V. blanda*—an invalid name for which Don substituted *V. LeConteana.* In this error LeConte was followed by subsequent botanists until 1905, when Britton, studying the plate of Willdenow, found that it clearly represented what was currently passing as *V. LeConteana.* Thus the long-standing error of LeConte was corrected, and the plant of Willdenow received just recognition.

The question now arose what should we call the false *V. blanda* of LeConte. Here the thorough work of Fernald at the British Museum in 1903 solved the problem. He found there the type of Bank's *rotundifolia* Mich. var. *pallens,* photographed his sheet of seven plants, and was convinced that three of them were plainly our common northern plant and that *"pallens"* was the correct specific name for LeConte's *V. blanda.* Thus after a period of 79 years the names of these two white violets were finally established.

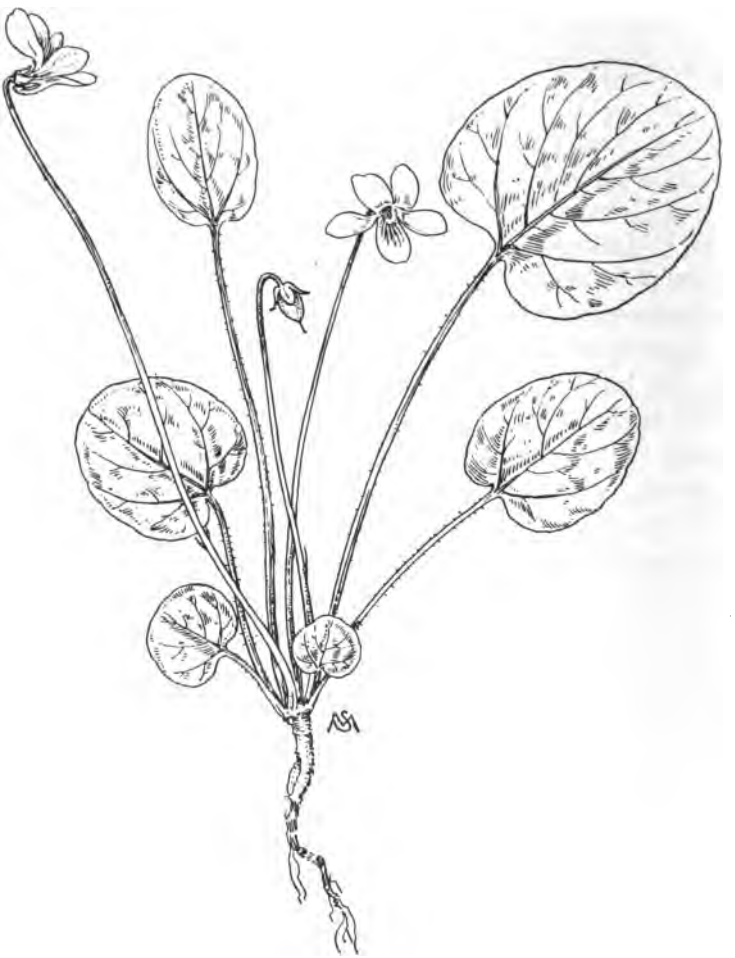
[1] Prodromus 1: 295. 1824.

See color-plate, Species No. 35, opposite page 69.

V. pallens is a plant of much colder habitat that *V. blanda.* It occurs in Labrador, Newfoundland, Gaspe County, Que,, and near the summit of mountains like Mansfield (Vt.) and Greylock (Mass.). It ascends some 2,000 feet higher than *V. blanda,* is a denizen of open bogs rather than of rich woodlands, and is at home in springy land and along cold brooks. Its nearest ally is *V. Macloskeyi* Lloyd, a species which is readily distinguished from *V. pallens* by the entire, or at most obscurely crenate, margin of the leaf.

Plants hardly separable from *V. pallens* have been collected by Prof. J. K. Henry at Stanley Park, Vancouver, B. C., and at other stations northward along the coast to the terraces of the Skeena River in lat. 55¼° N.

Our color-plate is based on a herbarium specimen collected in Middlebury, Vt., June 3, 1915, along the outlet of a cold spring at the base of the Green Mountains in eastern Middlebury. It is represented by Nos. 94 and 95 of my Distribution, 1910.



Species No. 36—Viola Macloskeyi Lloyd

Viola Macloskeyi Lloyd, Erythea 3: 74. May, 1895. Species No. 36.

The type in the Bronx Park Herbarium was collected July 22, 1894, at the base of Mount Hood, Ore., lat. 45° 20′, about 50 miles east of Portland. It was named in honor of Prof. Geo. Macloskey of Princeton University. It had been collected five years earlier by Mrs. Peckinpah in the mountains of Fresno County, Cal., and was published 12 years later as *V. anodonta* by Greene in Pitt. 5: 32. Sept., 1902. I collected a specimen July 7, 1897, at Meisner's Ranch, Eldorado County, on my first visit to California, and on my second visit in 1915 found it at many stations in the Truckee River Valley, Placer County, and have received several specimens from Mrs. Viola Brainerd Baird, Eggleston and others.

In 1910, F. F. Forbes sent me ample herbarium material grown in Brookline, Mass., of a plant originally from Banff, Alberta. I was surprised to find the specimens labelled "*Viola pallens* (Banks) Brainerd," as they were unmistakably *V. Macloskeyi.* It revealed, however, the close relationship of the two species and gave a new station for *V. Macloskeyi,* 377 miles further north than Mount Hood, about the distance in an air line from Philadelphia to Ottawa.

The line-drawing is based on a herbarium specimen from Deer Park, Placer Co., Cal., alt. 6,200 ft., Mrs. Baird, coll., July, 1910.

Species No. 37—**Viola primulifolia** L.

Viola primulifolia L. Sp. Pl. 934. 1753. Species No. 37.

This is the largest species of the white violets that grow in wet, open places, and has the widest range, extending along the coast from New Brunswick to Florida and Texas. In the North the foliage is usually glabrous, but in the South it is often notably pubescent, with petioles often broadly winged. This form was called var. *villosa* in the Manual of Eaton and, later, var. *australis* by Pollard.[1] In late summer and in autumn the species is propagated by leafy and creeping floriferous stolons.

Specimens of var. *villosa* Eaton are to be found in Nos. 123, 124, 125 of my Distribution of Violets, 1910.

[1] Bot. Gaz. 26: 342. Nov., 1898.

Species No. 38—**Viola occidentalis** (Gray) Howell

Viola occidentalis (Gray) Howell, Fl. N. W. Am. 69. Mar. 10, 1897. Species No. 38.

Though found only on the Pacific Coast this violet seemed so nearly related to *V. primulifolia,* over 1,800 miles to the southeast, that Gray[1] regarded it as only a variety of the eastern plant. But a careful study of the type in the Gray Herbarium, collected at Waldo, Ore., June 5, 1884, and of other data convinced me that Howell was justified in publishing it as a valid species in 1897. His description is detailed and as exact as could be expected when based on only a single collection. This conviction is strongly confirmed by the study of a specimen in my possession from Gasquets, Del Norte Co., Cal., not far from the type station, Miss Alice Eastwood, collector, April, 1907; also by two specimens in the National Herbarium. (1) F. A. Walpole, 2114, 10 miles west of Waldo, Ore., April 26, 1902; (2) C. V. Piper, 6107, 8 miles south of Waldo, Ore., June 14, 1904.

An admirable water-color of the type in the Gray Herbarium was painted for me in June, 1918, 34 years after its collection by Howell; from this was made the line-drawing here presented.

[1] *V. primulifolia* L. var. *occidentalis* Gray. Bot. Gaz. 11: 225. Nov., 1886; and Synop. Fl., p. 198.

Species No. 39—**Viola lanceolata** L.

Viola lanceolata L. Sp. Pl. 934. 1753. Species No. 39.

The habitat of this eastern white violet is the same as that of *V. primulifolia,* but its range is more to the northwest—from Nova Scotia to Minnesota, but southward only to the Piedmont plateau, the northern border of the Coastal Plain. This northwestern range is shown by the fact that no station for *V. primulifolia* is known in Vermont, but for *V. lanceolata* there are five.

V. lanceolata at vernal flowering is a small plant, but its foliage in summer often attains the height of 10 or 12 inches. Later it puts forth in favorable soil numerous stolons that root freely, branch and in the following spring bear at their tips new flowering plants. Specimens illustrating this method of propagation are to be seen in Nos. 70 and 71 of my Distribution of Eastern North American Violets, 1910.

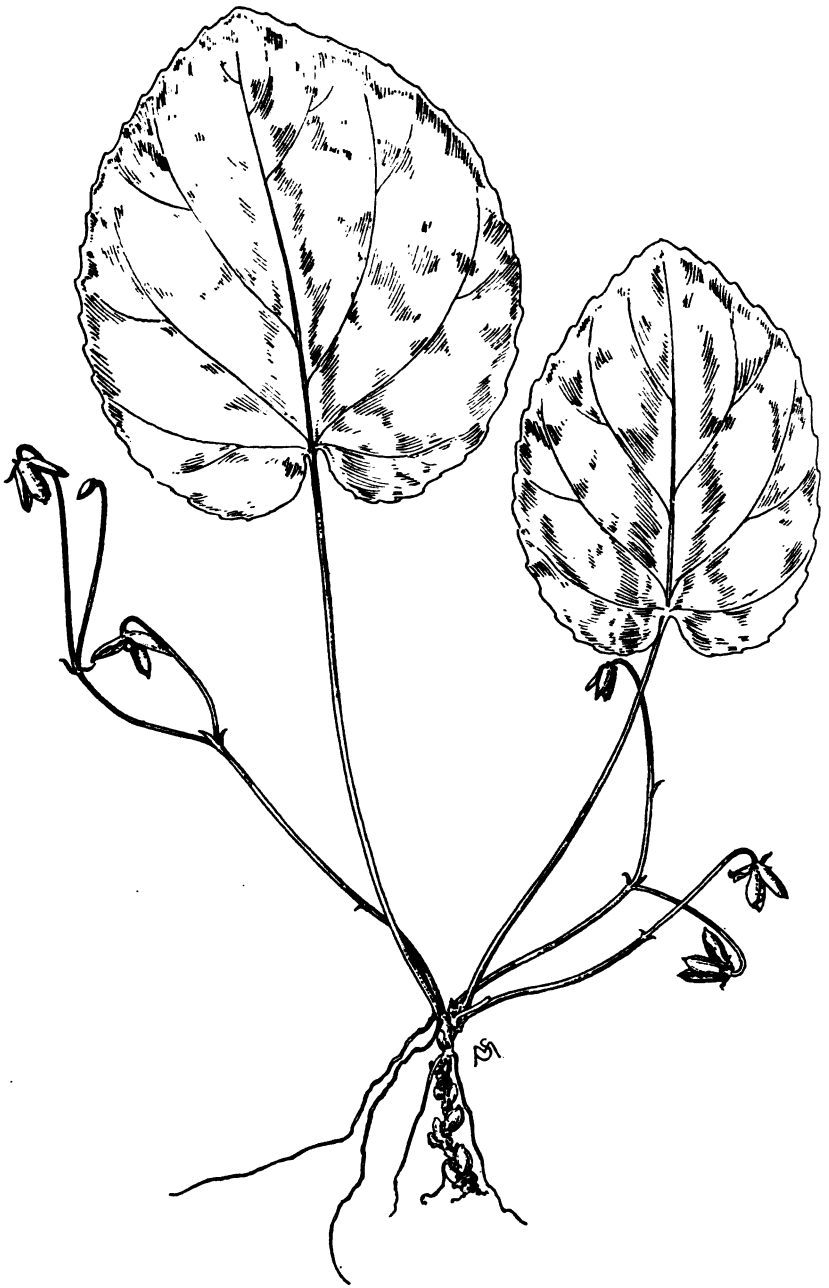
Species No. 40—**Viola vittata** Greene

Viola vittata Greene, Pitt. 3: 258. Feb., 1898. Species No. 40.

This species of open bogs and borders of marshy ponds is confined to the southern coast from Georgia to Texas. Before its recognition by Greene it masqueraded as *V. lanceolata* L. LeConte's water-color of *V. lanceolata* represents, not the species of Linnaeus, but *V. vittata*. The specific name alludes to the resemblance of the foliage to the fronds of Vittaria, a genus of the Fern family. The mature leaf of *V. vittata* is linear, 4-10 mm. wide, 15-30 cm. long, mucronately serrulate. Unmindful of Greene's publication Pollard in 1901[1] published it as *V. denticulosa*.

Our line-drawing is of a herbarium specimen collected in Florida, March 30, 1909, along the road from DeLand to the DeLeon Springs. Characteristic specimens may be seen in Nos. 178 and 179 of my Distribution of Violets, 1910.

[1] Bull. Torr. Cl. 28: 475.



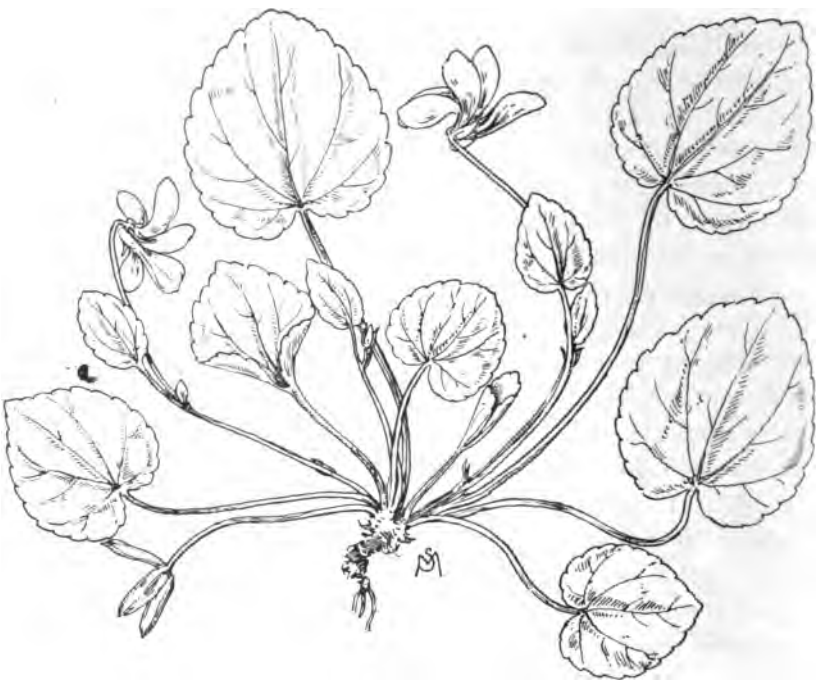
Species No. 41—**Viola rotundifolia** Michx.

Viola rotundifolia Michx., Fl. Bor. Am. 2: 150. 1803. Species No. 41.

This violet is readily distinguished when seen in vernal flowering, but has been a source of perplexity, as it appears in autumn. To this autumn form Pursh gave the name *V. clandestina,* cautiously adding: "*V. rotundifolia* Michx., Fl. Amer. 2, p. 150, in shady beech woods among rotten wood and rich vegetable mould . . . . flowers of a chocolate brown." Concerning this correct surmise, Schweintz dogmatically states[1] that Pursh's plant and Michaux's "can have no affinity whatever"; yet they have proved to be identical! We now understand the plant's peculiar method of bearing in late summer cleistogamous flowers and fruit on raceme-like stems—not on stolons, as these stems never root nor produce new plants, as seen in line-drawing.[2] The white violet *V. renifolia* is like *V. rotundifolia* in having no stolons, in this respect differing from all other white violets, for these bear cleistogamous flowers and fruit in abundance on stolons.

This unique species is usually found in cold, rich woodlands from Maine west to Lake Huron and south along the Alleghanies to Rabun County, Ga. Its affinity to *V. orbiculata* of northwestern America is manifest, though the two species grow in regions widely apart. This relationship is seen in the shape of the leaves as is indicated by the specific names, by the yellow vernal flowers, and by the later cleistogamous flowers on raceme-like stems. The two points of difference are: (1) The presence of several small leaves on the raceme-like stems of *V. orbiculata;* but only an occasional one on those of *V. rotundifolia;* (2) the seeds of *V. orbiculata* are brown and relatively broad; those of *V. rotundifolia* grayish white and smaller.

[1] Am. Jour. Sci. 5: 63. 1822.
[2] Cf. Greene in Pitt. 3: 255. Dec., 1897.
See also color-plate, Species No. 41, opposite page 100.



Species No. 42b—**Viola orbiculata** Geyer

Viola orbiculata Geyer, Hook. London Jour. Bot. 6: 73. 1847. Holz. Cont. U. S. Nat'l Herb. 3: 214-5, pl. 4. 1895. Species No. 42.

This rare and beautiful violet of northwestern America commemorates a talented and enthusiastic young German, Carl A. Geyer, who first collected and named it. In Hooker's Jour. Bot. 7: 181-3, 1855, appeared an interesting obituary of Geyer by Dr. H. G. Reichenbach of Berlin, from which we learn that in February, 1834, Geyer, when hardly more than 23 years of age, left Dresden for North America, to satisfy his thirst for exploration. For nearly ten years he endured hardship due to illness and to abuse from Indians. On November 13, 1844, he sailed from Vancouver Island and reached England by way of the Hawaiian group in May, 1845. The following September, much broken in health, he returned to Dresden, where he died November 21, 1853.

The type of *V. orbiculata* was collected in dark, shady woods of *Thuja gigantea* in the Coeur d'Alene Mountains of Idaho, June, 1844, and was published by Hooker in the London journal above cited, as a doubtful *V. rotundifolia* with the statement that if it "proves distinct Mr. Geyer's manuscript names of *V. orbiculata* should be adopted." The plant was first collected, though not published, by David Douglas. Gray, however, to the last held it to be a variety of *V. sarmentosa;* but it was recognized at the National Herbarium as a valid species and illustrated by a plate representing both its early and its late summer stages.

As known at present, the stations for *V. orbiculata* are in western Montana, northern Idaho, Oregon, Washington and North in British Columbia to lat. 55¼°, long. 127° 40′. Our color-plate and line-drawing are based on a plant from the last named station, Prof. J. K. Henry, coll., June 17, 1915, in wet, mountain woods (altitude 4,200 feet) near Hazelton, B. C. The species is plainly a near relative of *V. rotundifolia,* though the tracts where the two species occur are more than 1,600 miles apart, about the distance from New York City to Denver, Colo.

See also color-plate, Species No. 42, opposite page 100.

Species No. 43—**Viola sarmentosa** Dougl.

Viola sarmentosa Dougl. in Hooker's Fl. Bor. Am. 1: 80. 1830.[1] Species No. 43.

The most northern station known for *V. sarmentosa* is Victoria, B. C. "Dry woods and banks Shawingan, Vancouver Island, J. K. Henry, No. 9112, May 9, 1915." Thence it ranges southward to Marin County, Cal., on the coast, but not along the Sierra Nevada as does *V. praemorsa.* In Torrey and Gray's Flora of 1838, a station for *V. sarmentosa* is cited "near Walla Walla, Mr. Townsend," 190 miles east of Portland, Ore. This was doubtless *V. orbiculata,* as was also the plant reported from Idaho as *V. sarmentosa* in the Synop. Fl., p. 199.

My herbarium contains the following additional specimens:

1. Salem, Ore., Geo. M. Darrow, a live plant unnamed, sent September 11, 1911.

2. Fort Bragg, Mendocino Co., Cal., Miss Alice Eastwood, August, 1912.

3. Fort Bragg, Mendocino Co., Cal., Mrs. Viola Brainerd Baird and E. Brainerd, August 20, 1915.

4. Marin County Cal., M. E. Parsons, May 5, 1912.

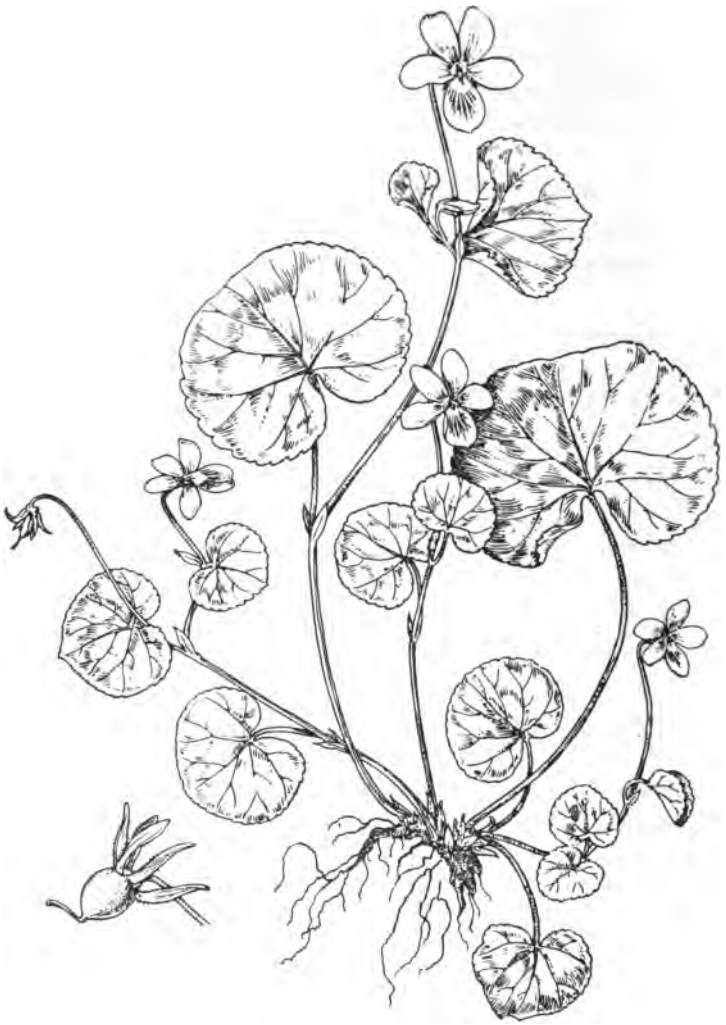
5. Marin County, Cal., Miss Eastwood, June 6, 1899, No. 16, North American Violaceae, United States National Herbarium.

6. Marin County, Cal., Mrs. Viola Brainerd Baird and E. Brainerd, under redwoods, Mount Tamalpais, August 7, 1915.

In Pitt. 4: 8, Jan., 1899, Greene renamed this species *V. sempervirens,* because *"V. sarmentosa"* had been given by an old world botanist in 1808 to a plant that later proved to be *V. odorata* L. But by the international code the name *V. sarmentosa* Dougl. is not thereby invalidated. It is, however, interesting to note that the leaves of the species are evergreen, i. e., sempervirent, and coriaceous.

The line-drawing is made from a herbarium specimen, Mount Vision, Inverness, Marin Co., Cal., Mrs. Viola Brainerd Baird coll., March 26, 1916.

[1] It should be borne in mind that at the date of this publication and until 1845, British North America extended on the Pacific Coast well south of the Columbia River.



Species No. 44—**Viola biflora** L.

Species No. 41a—**Viola rotundifolia** Michx.

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Species No. 42a—**Viola orbiculata** Geyer

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Species No. 45—**Viola pedunculata** Torr. & Gray

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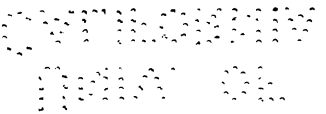
Species No. 46a—**Viola Nuttallii** Pursh



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Viola biflora L. Sp. Pl. 936. 1753. Species No. 44.

This species is a notable instance of the migration of a widely distributed species of the Old World to North America across the Bering Sea and southward along the Rocky Mountains to Colorado. The genus *Viola* was not alone in this migration. Gray, after a study of the Flora of Japan, was convinced that an "interchange of temperate species between North America and Europe had taken place by way of Asia."

In his monograph, Violae Europaeae, Wilhelm Becker has given in detail the distribution of *V. biflora.* It is found in nearly all the high mountains from the Pyrenees through Switzerland, Germany, Austria, Scandinavia and Russia, and in Siberia, West and North China and Japan.

The characters of the species are so unique that European specialists assign to *V. biflora* alone one of the three special sections into which they divide the genus. Our line-drawing—an exact copy of the plate of Reichenbach made in 1839[1]—shows the general character of foliage, flowers and fruit, but falls far short of the beautiful coloring to be seen in a painting by Mathews.

[1] Reichenb. Ic. Fl. Germ. iii, t. 1, fig. 4489.

Viola pedunculata Torr. & Gray, Fl. No. Am. 1: 141. July, 1838. Species No. 45.

We copy in full the original description of this species, probably from the pen of Torrey. It differs much in phraseology from that which appeared 57 years later in the Synoptical Flora.

"Somewhat pubescent; stem short; leaves rhombic-ovate, crenately toothed, abruptly narrowed at the base into a petiole; stipules linear-lanceolate, entire, stigma somewhat triangular, emarginate; spur very short; appendages of the inferior stamens wing-form, a little produced at the base.

"California, Douglas.—Lamina of the leaves scarcely an inch long, rather thick, with coarse, obtuse teeth. Peduncles 2-3 times as long as the leaves. Flowers large, deep yellow. Sepals oblong, obtuse. Petals broadly obovate; the two upper ones with conspicuous claws; lateral ones bearded at the base. Summit of the filaments rounded. Stigma with a minute lip on the lower edge."

The species is found abundant from San Francisco Bay to San Diego, Cal., and thence eastward nearly to Arizona. It is highly esteemed for its beauty, often cultivated in gardens, and the flowers are said to be often for sale in the market. This is one of the 25 species that Gray finally accepted as peculiar to North America—13 being east of the Continental Divide and 12 west, viz.:—*V. sarmentosa* Dougl. *V. chrysantha* Hook. *V. Hallii* Gray. *V. glabella* Nutt. *V. pedunculata* Torr. & Gray. *V. Sheltonii* Torr. *V. trinervata* Howell. *V. ocellata* Torr. & Gray. *V. praemorsa* Dougl. *V. Beckwithii* Torr. & Gray. *V. lobata* Benth. *V. cuneata* Watson.

Our color-plate is based on a specimen from South San Francisco collected by Mrs. Viola Brainerd Baird, March, 1916, and painted by Mathews the following May.

See color-plate, Species No. 45, opposite page 101.

Viola Nuttallii Pursh, Fl. 1: 174. 1814. Species No. 46.

"On the banks of the Missouri, June, v. s. in Herb. Nuttall."

This species bears the name of a famous student of the natural history of North America from 1808 to 1842. Schweinitz calls him a man of "unsparing zeal." The intense enthusiasm with which he worked sometimes excited the ridicule of his associates. Occasionally he was reckless of danger and prostrate from fatigue or illness. In 1825, his reputation as a naturalist led to his appointment as Curator of the Harvard Botanical Garden, a position he retained until 1834, when his renewed longing for the wild led him to resign and visit for exploration the Pacific Coast. In 1834 he went with the Wyeth expedition across the continent to Oregon. During the winters of 1834-35 and 1835-36, he made two trips to the Hawaiian Islands. In May, 1836, he left San Diego, Cal., on a ship sailing around Cape Horn in a southern winter, and reached Boston the following October. The story of his romantic trip is told in Dana's well-known "Two Years Before the Mast." See also the account of the expedition by John K. Townsend and Captain Wyeth's letters and journals. The next five years Nuttall lived in Philadelphia. In 1838 appeared the first part of Torrey's and Gray's Flora of North America, to which Nuttall contributed numerous descriptions of plants; in 1840 he published extended accounts of new species collected in the United States and the Hawaiian Islands; and in 1841 he wrote his Sylva of North America. On December 25, 1841, he left America to make his home in England, having received the bequest of an estate between Manchester and Liverpool; and here he lived until his death, September 10, 1859, with the exception of the winter of 1847-48, spent in Philadelphia working up for publication the Rocky Mountain plants of Dr. Gambel.

Species No. 46—**Viola Nuttallii** Pursh

There never has been any question as to what plant Pursh described as *V. Nuttallii,* since it was collected by Nuttall in 1811 while with the Astor Expedition on the Missouri River; and Eggleston of the Bureau of Plant Industry, United States Department of Agriculture, to whom we are largely indebted for information, is confident that Nuttall's type came from South Dakota, since on the first of June the Astor party had reached the river on the south line of South Dakota near the present town of Yankton and by the latter part of June had reached the Arickaree village, in Corson County, S. D.

The foliage displays marked fluctuations, some of which have received specific names. *V. linguaefolia* Nutt. is a form with large elongate root-leaves, *V. vallicola* Nelson a form with widened ovate root-leaves.

The color-plate is based on a specimen from Grey Cliff, Mont., altitude 3,904 feet; Eggleston, No. 7871. May 31, 1912.

The line-drawing is made from t. 26, Hooker's Fl. Am. Bor. 1579. 1830.

See also color-plate, Species No. 46, opposite page 101.

Species No. 47—**Viola praemorsa** Dougl.

Viola praemorsa Dougl. in Lindley's Bot. Register 15, t. 1254. 1829. Species No. 47.

I am greatly indebted to Eggleston for valuable facts regarding the publication of this species, in substance as follows: Lindley's Botanical Register was the organ of the London Horticultural Society, under whose auspices David Douglas explored the botany of the Pacific Coast north of California. In 1914 this Society published an exact copy of his journals. From them we learn that his first violet, *V. praemorsa,* was collected about May 1, 1825, above Astoria on the Columbia River. He secured seeds that were sent by a vessel sailing October, 1825, and reaching England in 1826; from these flowering plants were obtained at least as early as 1828. His specific name, "bitten off" or "truncate," alludes, it is said, to the condition of the rootstocks in the dry, sandy soil where they grew. Lindley tells us in his paper that the drawing for t. 1254 that appeared in the Botanical Register, August 1, 1829, was made in 1828 in the garden of the Horticultural Society. The artist, M. Hart, has figured only that part of the plant that appeared above the soil. It presents a luxuriant specimen having six large flowers, four full-grown and eight small leaves, and the tips of three basal stipules.

The plants in their native soil present an aspect quite unlike that of those raised from seed in England. In the 32 sheets of *V. praemorsa* in the writer's herbarium are to be seen specimens from Vancouver Island, lat. 48½° N., south through Lake County, Ore., and along the Sierra Nevada to the Stanislaus Forest in Tuolumne County, Cal., lat. 38° N. These plants have normally stout, sometimes branching root-stalks, bearing at petaliferous flowering one or more short stems, that, later, elongate and produce an abundance of cleistogamous flowers and seeds.

V. Bakeri Greene, Pitt. 3: 307, April, 1898, seems to be a subglabrous, depauperate form of *V. praemorsa* found in the mountains of Oregon and northwestern California.

Our line-drawing is of a specimen collected in the Truckee River Valley, Placer Co., Cal., altitude 7,100 feet, July 5, 1915.

Species No. 48—**Viola purpurea** Kellogg

Viola purpurea Kellogg, Proc. Cal. Acad. 1: 55. May, 1855. Species No. 48.

V. aurea Kellogg, Proc. Cal. Acad. 2: 185, t. 54. Sept., 1862.

Both types are described in detail; *V. aurea,* Kellogg states was "brought from Nevada Territory—an alpine species almost woolly in its external appearance." A careful comparison of his descriptions leaves no doubt as to their specific identity.

The species is well distributed through California. I have specimens from six counties: along the coast from Santa Barbara, Kern, Santa Cruz, and in the Sierra Nevada from Calaveras, Nevada and Siskiyou. Jepson, in Fl. West. Mid. Cal., ed. 2, p. 266, Jan., 1911, gives the range of *V. purpurea* Kell. as "Coast Range peaks and high mountain ridges: Loma Prieta, Mount Diabalo, Napa and Mount Hood ranges and northward."

Our line-drawing is based on a herbarium specimen from Tehachapi, Kern Co., Cal., Agnes Chase coll., May 6, 1910; but it fails to show the minutely white-villous foliage of the model.

Viola purpurea Kellogg, var. **pinetorum** Greene, Fl. Francisc. 243. 1891. See also **V. pinetorum** Greene, Pitt. 2: 14. Nov., 1889.

This variety is abundant in the Lake Tahoe region of Placer County, Cal., and south, where the counties of Tuolumne, Calaveras, Alpine and Eldorado almost corner together. I first collected it near Echo Lake, Eldorado County, July 11, 1897, and in 1915 found it common south of Truckee, Cal.

Our illustration is based on a herbarium specimen from Five Lakes (altitude 7,540 feet), Placer Co., Cal., Mrs. Viola Brainerd Baird and E. Brainerd, coll., July 15, 1915.

Species No. 48b—**Viola purpurea** Kellogg var. **pinetorum** Greene

Viola purpurea Kellogg, var. **venosa** (Wats.) comb. nov.
V. Nuttallii, var. *venosa* Watson, Bot. King Exped. 35. 1871.
V. aurea, var. *venosa* Brewer & Watson, Bot. Cal. 1: 56. 1876.
V. atriplicifolia Greene, Pitt. 3. 38. May, 1896.
V. Thorii Nelson, Bull. Torr. Cl. 27: 193. 1900.
V. venosa (Wats.) Piper, Contrib. U. S. Hb. 11: 393. 1906.
V. atriplicifolia Thorii Nels., Coulter's Man. 321. 1909.

Watson's original collection was made in the mountains of northwest Nevada, "from the West Humboldt to the Watsatch usually near the snow line." I have a specimen[1] from Plumas County, Cal., quite like one of Watson's types.

The above synonymy indicates a wide distribution of this variety, but a careful study of the specimens shows a marked sameness of character except in the contour of the root-leaves, that vary all the way from nearly entire to coarsely dentate or shallowly lobed; and these forms occur sometimes in the same locality. This has made it difficult for authors to determine to what species the variety should be attached, if, indeed, it should not bear a specific name of its own. To me, its affinity seems nearest to *V. purpurea* Kellogg, in the neighborhood of which it is frequently found in Nevada, California and Oregon.

The line-drawing is of a plant from "The Craggs" (altitude 8,250 feet), Deer Park, Placer Co., Cal., Brainerd, coll., July 19, 1915.

[1]Mrs. Austin, coll., 1877. C. G. Pringle, donor.

Species No. 48c—**Viola purpurea** Kellogg var. **venosa** (Wats.)

Viola chrysantha Hooker, Icones Plantarum, t. 49. 1837. Species No. 49.

The description of Hooker and the accompanying plate are in many respects faulty, apparently due to defects in the type specimen or to its receiving some later injury. A more complete diagnosis was given a year later in Torrey and Gray's Flora 1: 143, 1838, where the lower petal is correctly described as "slightly saccate at the base."

The type of Douglas was collected at Monterey, lat. 36½° N. on the coast of California. The fine color-plate here presented is from a painting by Mathews, based on a dried plant collected at Big Bear Lake, altitude 7,200 feet, near the city of San Bernardino, Cal., May 26, 1917, G. D. LaMotte, coll.

This violet seems not to be abundant in any one locality, but has been collected in about 10 different counties, as appears by mounted specimens in the University Herbarium at Berkeley, Cal. The writer has a flowering specimen from Plumas County, collected by Mrs. Ames, 1876, and one from Shasta County, Alice Eastwood, June and July, 1912. Howell reports it from Medford, Ore., 21 miles north of the California line. Probably many other stations will be found from time to time in this large state extending through nine degrees of latitude, a distance of 600 miles. The map shows that a state the length of California, if laid out on the Atlantic Coast would reach from New York City as far south as Savannah, Ga.

V. chrysantha was most appropriately called by the elder Hooker the "golden flower," and may justly be classed with *V. pedunculata*, *V. Hallii* and *V. cuneata* as one of the most beautiful violets of the Pacific coast.

See color-plate, Species No. 49, opposite page 132.

Species No. 50—**Viola Sheltonii** Torr.

Viola Sheltonii Torr. in Whipple Survey 35th Parallel, Pacif. R. R. report 4: 67, t. 2. 1856. Species No. 50.

Five localities are given for this species in the Synop. Fl., namely, Colusa, Lake and Plumas Counties, Cal., southern Oregon and White Salmon Valley, Wash. In 1913, Eggleston collected it in Calaveras County, and in 1912, Miss Eastwood in Placer County, Cal. In Torrey's original publication only the type station is cited, "hillsides, Yuba; near Downieville, May 8 (1854, Dr. J. M. Bigelow)," Sierra Co., Cal.

V. biternata Greene[1] is to me not distinct from *V. Sheltonii* except as growing much farther east. I have a leaf of Greene's type which is a good match for those of *V. Sheltonii.* The types of *V. biternata* are C. F. Baker's No. 42, from Cerro, Colo., and No. 233, from Grand Mesa, Colo., June, 1901.

These scattered stations stretching for over 575 miles north and south will probably in time be connected with scores of others.

Our line-drawing is a copy of the illustration "t. 2" that appeared with Torrey's original report in 1856.

[1] Plantae Bakeri, 3: 12. Nov., 1901.

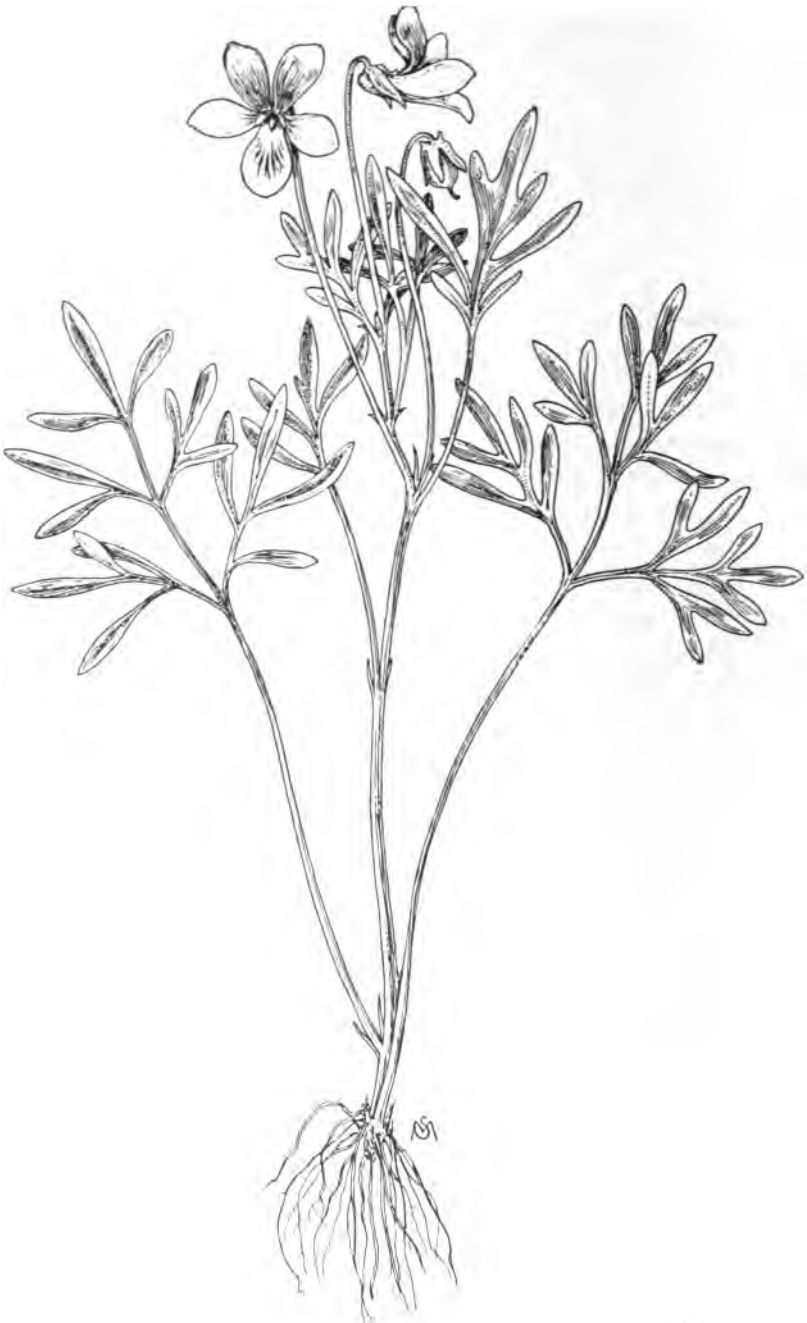
Species No. 51—**Viola Beckwithii** Torr.

Viola Beckwithii Torr. & Gray in Beckwith Survey 41st Parallel, Pacific R. R. report 2: 119, t. 1. 1855. Species No. 51.

The type came from Diamond Mountain, Eureka Co., Nev., "between Great Salt Lake and the Sierra Nevada." I have a specimen, given me by Coulter, collected by Mrs. R. M. Austin at Plumas County, Cal., about 250 miles west of the type station; one from Golconda, Humboldt Co., Nev., about 50 miles northwest of the type station; and a third from Salt Lake City, Utah, A. O. Garrett, coll., April 19, 1912. But most helpful of all is a large collection from Verdi, Nev., almost on the Californian border, 20 miles north of Lake Tahoe, made April 1, 1921, and sent me well preserved by Mrs. Viola Brainerd Baird. These specimens are quite hirsute as in the type, and reveal a flower that may be thus described: Upper petals dark violet; lateral petals lilac to white, the base yellow and bearded; spur petal longer, lilac, the yellow base marked with 7-9 purple striae, but plants occur with spur petal varying to white.

Torrey, in his account of *V. Sheltonii,* 1856, casually speaks of the two upper petals of *V. Beckwithii* as "purple," and in the original report of 1855, Torrey and Gray call them "deep-violet." These two terms are in substantial agreement with "dark violet."

The line-drawing is an exact copy of Isaac Sprague's t. 1. 1855.



Species No. 52—**Viola Hallii** Gray

Viola Hallii Gray, Proc. Am. Acad. 8: 377. 1872. Species No. 52.

This is one of the rarest of the 25 North American violets selected for our color-plates, and among the latest to receive recognition. It was originally published in Gray's report of the plants collected by Elihu Hall in Oregon. Fourteen years later in his revision of North American violets[1] he redescribed it as follows:—"Glabrous throughout; the leaves of ovate or oblong or of irregular outline, sub-pinnately or pedately about twice parted into lanceolate or linear lobes, their tips obtuse or acutish and callous apiculate, veins or ribs indistinct; upper stipules commonly foliaceous, often enlarged and laciniate or entire; upper petals deep blue, others yellow or cream-color. From Salem, Ore., to Humboldt County, Cal. More caulescent than the preceding."—*V. chrysantha, V. Beckwithii, V. Sheltonii.*

To this should be added Dr. Hall's description of the living plant:[2] "Two upper petals dark, velvety purple, almost black, lowest petal white with yellow-veined base, lateral petals same color with short, hairy patch on claws." This indicates a flower much like that of *V. cuneata,* see color-plate species No. 64. In the Synoptical Flora the term "violet-purple" is used for the upper petals of both species.

The rare occurrence of *V. Hallii* is indicated by the fact that it is now represented in the Herbarium of the University of California by only three mounted specimens, viz.:

1. Salmon Mountains, Parker Co. and Trinity Co., Cal., July.
2. Kneeland Prairie, Humboldt Co., Cal., May.
3. Buck Mountain, Humboldt Co., Cal., altitude 5,000 feet, June.

"Near the summit, frequent in gravelly, open spots in the chaparal."

The color-plate is of a water-color by Mathews (May, 1918), based on a specimen in the Gray Herbarium from Grant's Pass, Ore., the color after description in the Synoptical Flora, "Petals strongly two-colored, lateral and lower yellow or cream-color."

The line-drawing is from the same specimen, with added roots.

[1] Bot. Gaz. 11: 253-6. Nov., 1886.
[2] In letter from Mrs. Viola Brainerd Baird, Berkeley, Cal.
See also color-plate, Species No. 52, opposite page 132.

Species No. 53—**Viola trinervata** Howell

Viola trinervata Howell, Gray in Bot. Gaz. 11: 290. Nov., 1886. Species No. 53.

V. chrysantha var. *glaberima* Torr., Bot. Wilkes Exped. 238. 1874.

V. Beckwithii var. *trinervata* Howell, Bot. Gaz. 8: 207. 1883.

Through the kindness of Mr. W. R. Maxon, Associate Curator of the National Museum, I have been able to examine seven sheets of this rare species as described in the following table:

Station	*Lat.*	*Collector*	*Date of Collection*	*Number in National Herbarium*
Interior of Washington Territory		Wilkes Exploring Expedition, No. 1106.	1841.	7474
Klickitat County, Wash.	45° 54′	Thomas Howell.	April, 1882 "Ex herb. Wm. M. Canby."	7476
North Yakima, Wash.	46° 38′	From Frittillaria Club, 1890.		7475
Juniper Springs, Malheur Co., Ore., Alt. 4,335 feet.		John B. Leiberg, 2280.	June 15, 1896.	276 193
Hill near Ellensburg, Wash.	47°	Kirk Whited, No. 606.	April 8, 1898, in fl.	366 336
Mount Rainier Forest Reserve, Wash.	46° 55′	J. B. Fleet.	June 5, 1899.	415 548
Stehekin, eastern Washington.	48° 16′	David Griffiths & J. S. Cotton.	June, 1902, in fl.	527 524

The color of the petals may be learned fairly well from the notes of collectors or from the dried specimens. In the Bot. Gaz., 1886, Gray quotes Torrey as saying in his 1874 paper that "the upper petals are purplish and the others yellow (doubtless from Pickering's notes)." Howell in his Flora of northwest America, March, 1897, says "upper petals dark blue, the others pale blue with a yellow base." This probably is a not infrequent misuse of the word "blue" for "violet," as we commonly speak of "the blue violets," avoiding the correct but awkward term "violet violets."

In specimen No. 7475 National Herbarium the upper petals are plainly dark violet as in *V. Beckwithii,* and one spur-petal has nine striae on its lower half. The upper dark petals are to be seen also on specimens No. 366 336 and No. 527 524 Nat'l Hb.

Our line-drawing is from specimen No. 7476 Nat'l Hb., T. Howell, coll., April, 1882, "ex herb. Wm. M. Canby."

V. hastata Michx., Bor. Am. 2: 149. 1803. Species No. 54.

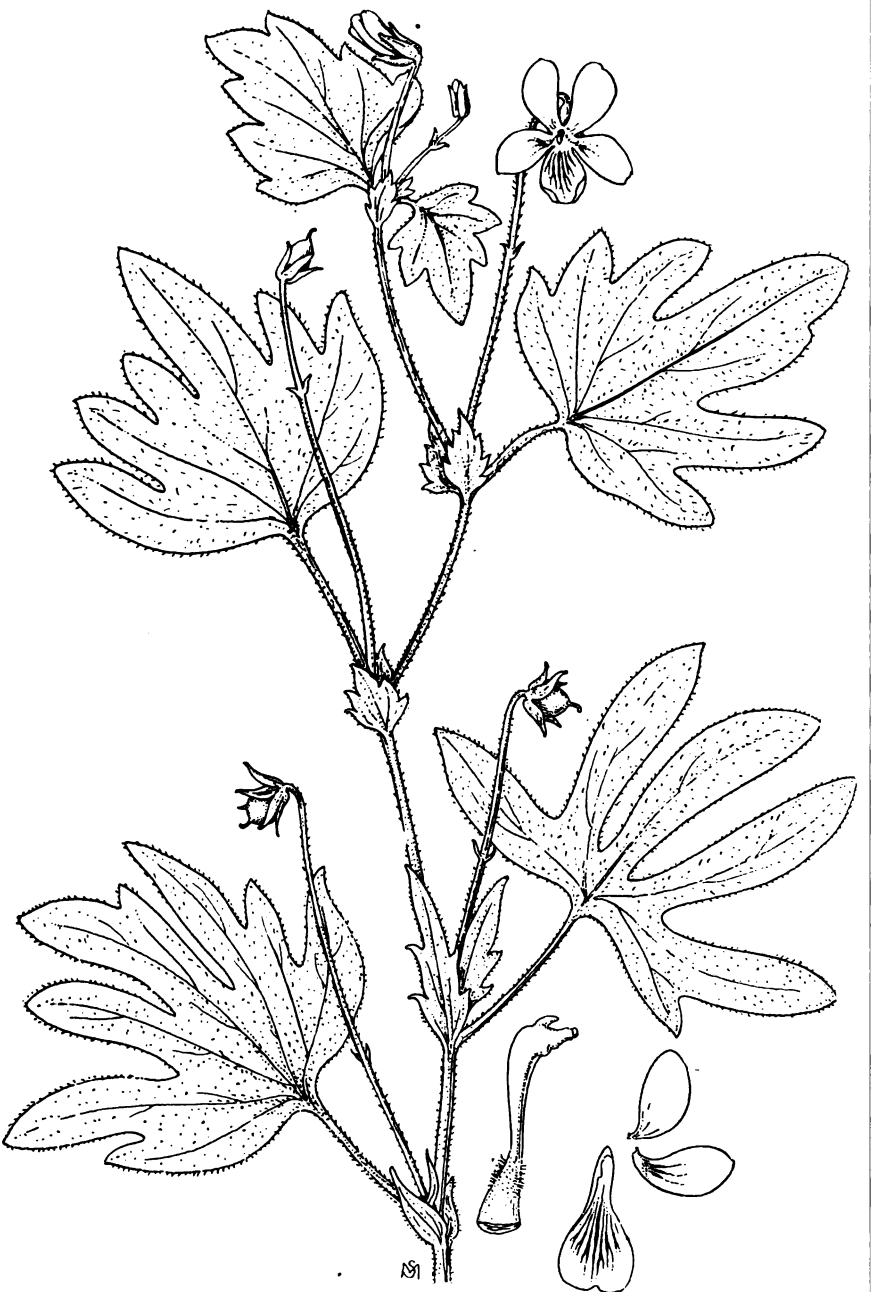
The species was well described by Michaux, and also nine years later by Pursh. LeConte, 1826, for reasons that will appear later, regarded *V. tripartita* Ell. as a variety of *V. hastata,* and Gray 40 years afterward endorsed this opinion.[1] But there is a radical difference between the two. The rootstock of *V. hastata* is brittle, whitish, and has capillary roots; that of *V. tripartita* is woody, brown, and has coarse, fibrous roots. A comparison of the color-plate of the former with the line-drawing No. 56 of the latter reveals their specific unlikeness, both in foliage and rootstock.

But *V. tripartita* is closely associated with a form having uncut leaves: *V. hastata* var. *glaberrima* Gingins in DeCandolle's Prodromus 1: 300. 1824. This was published in 1900 as *V. tripartita* var. *glaberrima* (Gingins) Harper,[2] a plant often found in the vicinity of Biltmore and Tryon, N. C., and as far southwest as Tuscaloosa, Ala. The writer has visited these stations and found Elliott's species and Harper's variety of it to be often associated and intergrading. The habitat is that well described by LeConte—"dark forests and ravines where the soil is enriched by dead leaves and rotten wood." He speaks of its close relationship to *V. pubescens,* so that it may be doubted if the two are distinct. Two of his water-colors well represent *V. tripartita* Ell. and Harper's intergrading variety.

But it is evident in the light of recent discoveries that we have here a case of dimorphism where a species and its variety for successive generations interbreed. This we have seen occurs with *V. Brittoniana* and *V. pectinata,* also in *V. lobata* of the West and its variety *integrifolia* Watson; and in other genera than *Viola.* A noted example is *Phaseolus multiflorus,* an American species with scarlet flowers and seeds, but interbreeding even in the wild with an albino variety.

V. hastata is found from Pennsylvania and Ohio south to Liberty County, Fla., about 30 miles southwest of Tallahassee, usually in rich woodlands. Our color-plate is based on a herbarium specimen from Tryon, N. C., Brainerd, coll., April 7, 1909. See also Nos. 62 and 63 of my Distribution of Eastern North American Violets, 1910.

[1] Bot. Gaz. 11: 291. Nov., 1886.
[2] Bull. Torr. Bot. Club 27: 337.
See color-plate, Species No. 54, opposite page 132.



Species No. 55—**Viola lobata** Benth.

Viola lobata Benth., Pl. Hartweg. 298. Species No. 55.

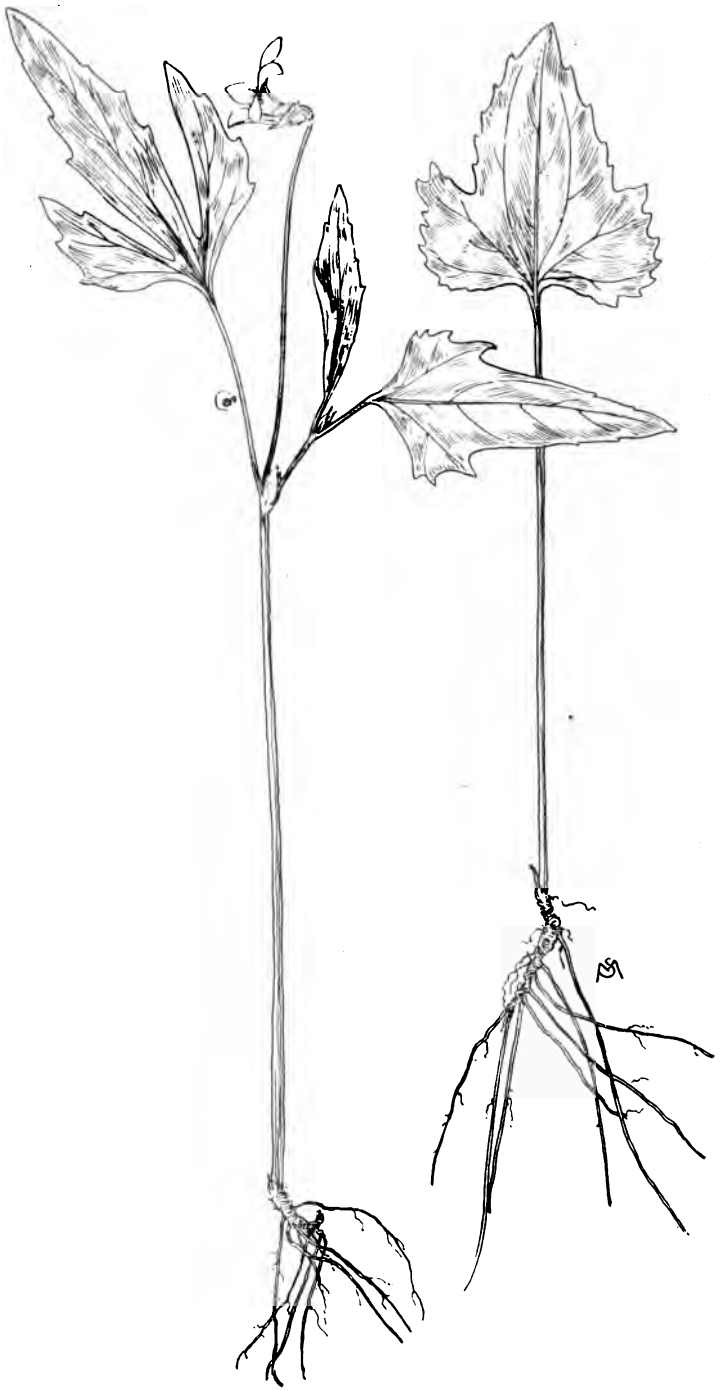
This species is almost confined to California. Its range is from the Yosemite Valley north to Nevada City, thence north to the contiguous counties Plumas, Butte and Siskiyou, and four miles north of California to Siskiyou, Ore.

The synonym *V. sequoiensis* Kellogg[1] came from Nevada City, Nevada County. Mrs. Baird and I visited the station July 31, 1915, and collected numerous specimens—all typical *V. lobata*. The supposed Sequoias proved to be firs.

The dimorphism of *V. lobata* and its var. *integrifolia* Watson[2] is discussed under *V. hastata* Michx., sp. No. 54; see also under *V. tripartita* Ell., sp. No. 56. It is gratifying to know that Dr. Gray[3] fully recognized the confluence of *V. lobata* with its digitately cleft or lobed leaves, and its very distinct variety "with mostly deltoid or rhombic-ovate, often caudate-acuminate leaves."

Our line-drawing is a reproduction of fig. 55, *V. sequoiensis* Kellogg.

[1] Proc. Cal. Acad. 2: 185, fig. 55. 1863.
[2] *V. Brooksii* Kellogg. Cal. Hort. 9: 281. 1879.
[3] Bot. Gaz. 11: 290. Nov., 1886.



Species No. 56—**Viola tripartita** Ell.

Viola tripartita Ell., Bot. S. C. & Ga. 1:302. 1817. Species No. 56.

The type of Elliott's species came from near Athens, Jackson Co., Ga., but the species is best developed in the western mountains of the Carolinas. Its botanical history is connected with a plant having uncut foliage usually growing with it. This was first described by Schweinitz[1] as "*V. striata* LeConte and Nobis. Non *V. striata* auctorum." His description is detailed and exact and the plant can be positively identified. Two years later it appeared as *V. hastata* var. *glaberrima* DC., Prodr. 1: 300. 1824.

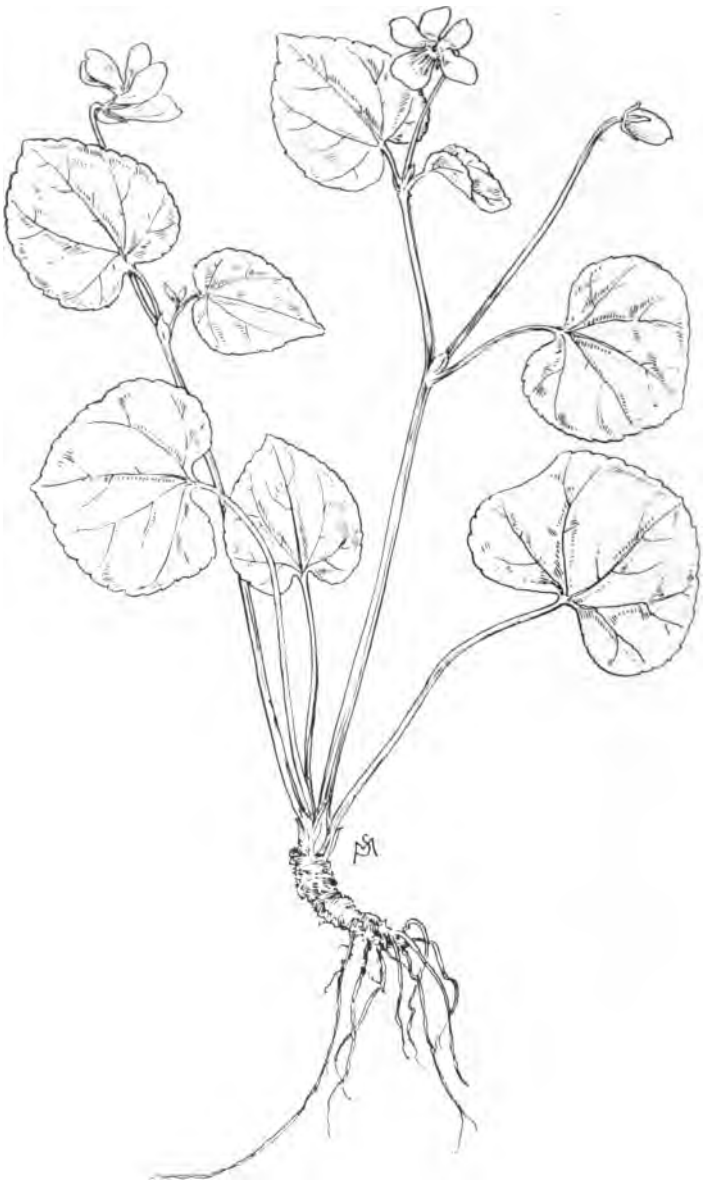
In 1826, LeConte in his monograph of Viola[2] held the plant to be doubtfully distinct from *V. pubescens* Ait., but published both this and *V. tripartita* as varieties 1 and 2 of *V. hastata.* Two of his extant water-colors are: (1) Typical *V. tripartita;* (2) a plant somewhat resembling *V. pubescens* Ait. in foliage, but not in pubescence nor in cordate leaf. In 1900 the latter plant was renamed[3] *V. tripartita* Ell. var. *glaberrima* (Ging.) Harper.

With the new century, material accumulated rapidly. Many specimens were distributed from Biltmore, N. C., by Pollard, by Eggleston, and from Oconee County, S. C., by H. D. House. In April, 1909 and in 1910, I visited the stations in Biltmore and Tryon, N. C., and in Tuscaloosa, Ala., and found the uncut-leaved variety usually growing with *V. tripartita* and variously intergrading with it. See Nos. 173 and 174 of Distribution, 1910, for these two forms.

As already stated under *V. hastata,* sp. No. 54, we have here evidently a case of dimorphism, where a species repeatedly interbreeds with its variety and the crossing is followed by Mendelian reversion.

The line-drawing is of a specimen from Biltmore, N. C., April 20, 1910.

[1] Am. Jour. Sci. 5: 76. April, 1822.
[2] Ann. Lyc. N. Y. 2: 151. 1826.
[3] Bull. Torr. Cl. 27: 337. 1900.



Species No. 57--**Viola glabella** Nutt.

Viola glabella Nutt. in Torr. & Gray Fl. 1: 142. 1838. Species No. 57.

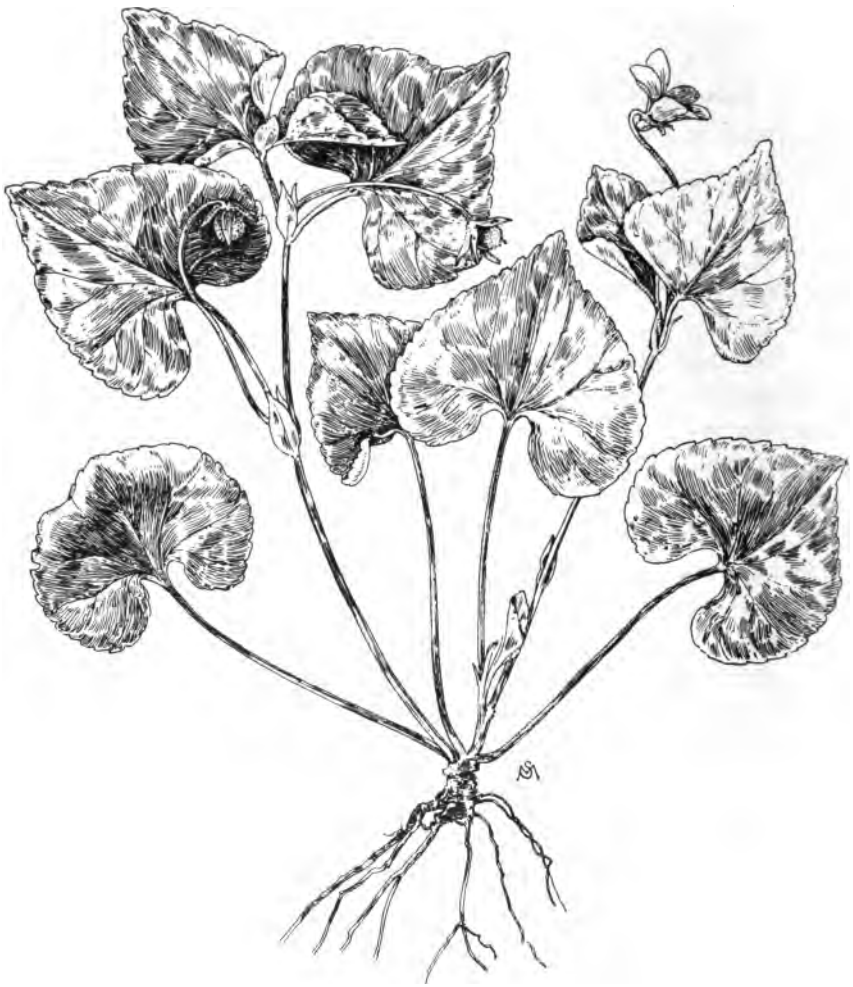
Gray[1] states that this is "a Pacific species ranging from the middle parts of California to Alaska and to Japan; its northernmost forms coming too near the Asiatic, *V. uniflora* L., while its most eastern in the northern Rocky Mountains are not easily distinguished from *V. pubescens.*"

The most northern station represented in my herbarium is Prince Rupert, B. C., lat. 54° N.; thence it ranges south in two different lines, one near the coast, often at sea-level, to Marin County, Cal., the other more inland through Salem, Ore., and along the Sierra Nevada, at altitudes from 3,500 to 7,500 feet, to the Yosemite Valley, Cal., lat. 38° N. All these stations are congenial to this Alaskan species, as they have about the same low temperature, due to the northern currents of the ocean on the east and to the snows of the Sierra Nevada on the west.

A few stations for *V. glabella* occur in northeastern Washington, northern Idaho and Montana; but *V. pubescens* and *V. eriocarpa,* the nearest of kin, though markedly different, occur only 800 miles to the east.

Our line-drawing is of a herbarium specimen from Five Lakes (altitude 7,540 feet), Placer Co., Cal., coll., Mrs. Viola Brainerd Baird and E. Brainerd, July 15, 1915.

[1] Bot. Gaz. 11: 291. Nov., 1886.



Species No. 58—**Viola eriocarpa** Schwein.

Viola eriocarpa Schwein., Am. Jour. Sci. 5: 75. 1822. Species No. 58.
Viola pubescens Ait., Hort. Kew. 3: 290. 1789. Species No. 59.

These two species are best discussed together. The line-drawings show their marked unlikeness when isolated from each other. But when growing together their characters are more or less commingled. We have discussed a similar confluence of *V. fimbriatula, V. emarginata* and *V. sagittata.* For this exchange of characters between two allied species DeVries[1] coined the word "vicinism."

The most characteristic *V. pubescens* is found from lat. 40° to 49° N., between Nova Scotia and the Dakotas; farther south it occurs mainly in the Appalachian Mountains. Schweinitz says it is never met with in Salem, N. C. Typical *V. eriocarpa* is found from lat. 35° to 36½° between western North Carolina and northeastern Oklahoma. Schweinitz devotes a whole page to the description of *V. eriocarpa,* tabulating a dozen points of distinction. An additional mark of difference is the coarseness or fineness of the dentation. Usually the stem-leaf of *V. eriocarpa* has 25 to 30 teeth, that of *V. pubescens,* 30 to 45.

In connection with this description, note line-drawing on both pages 130 and 132.

[1] Species and Varieties, p. 188. 1904.

Species No. 59—Viola pubescens Ait.

Species No. 49—**Viola chrysantha** Hooker

Species No. 52a—**Viola Hallii** Gray

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Species No. 54—**Viola hastata** Michx.

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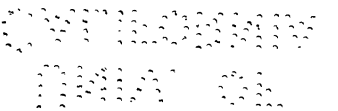
Species No. 64—**Viola cuneata** Watson



Schweintz at first called his plant *scabriuscula* from "the dispersed hairs on the nerves" and under *V. pubescens* a variety *scabriuscula,* is given in Torrey and Gray's Flora, 1838, citing *"V. scabriuscula* Schwein. MS." In 1886, Gray well said it "should have been named *glabriuscula* for it really is not scabrous." In habitat *V. pubescens* affects dry, rich woodlands, *V. eriocarpa,* low open woods and rich meadow bottoms.

Our illustration of *V. eriocarpa* is from a herbarium specimen collected near Muskogee, Okla., March 31, 1908; that of *V. pubescens* is a copy of Reichenbach's Ic. Pl. Crit. 1 : 45, t. 53, fig. 111, 1823. Specimens of *V. pubescens* may be seen in Nos. 126 and 127 of my Distribution of Violets, 1910, and of *V. eriocarpa* in Nos. 144, 145, 146 and 147.

Species No. 60—**Viola rugulosa** Greene

Viola rugulosa Greene, Pitt. 5: 26. Sept., 1902. Species No. 60.

The most northern station known is Hazelton, B. C., lat. 55½°, Prof. J. K. Henry, June 11, 1915. It is reported in seven states to the south and east of British Columbia.

1. Montana: Park and Sweet Grass Counties, Eggleston, May 11, and June 25, 1912.

2. Wyoming: Dale County, Greene; Laramie, Coulter.

3. Colorado: Boulder, Fort Collins, Eldora; abundant material from D. M. Andrews, E. Bethel and E. R. Cross.

4. Nebraska: Missouri River bluffs, Dixon County, A. A. Hunter, Coll., June 18, 1900; sent out from U. S. Nat'l Hb. as *V. canadensis.*

5. Minnesota: along Mississippi River at Fort Snelling, 8 miles below Minneapolis.

6. Iowa: Ill. Fl. 2: 559, 1913. Station not reported, probably on the river below Fort Snelling.

7. Washington: First Thought Mountain, Colville Forest, Stevens County, 4,000 ft. alt., July 19, 1916; 13128, Eggleston.

In its characters the species connects *V. pubescens* with *V. canadensis.* It is noteworthy for its vigorous branching stolons, well underground, by means of which the plant spreads rapidly in the wild and in the garden, quite after the manner of Quitch-grass (*Agropyron repens*). This character escaped the attention of Greene who says the rootstock does not seem to differ from that of *V. canadensis.* It attracted my attention when growing plants were examined in the New York Botanical Garden which were received through Mr. Andrews from the Boulder station. This led me to secure live plants from Fort Snelling, through the kindness of Clement, to determine if they were not also stoloniferous. Greene applied the name *rugulosa* only to the Minnesota plant; that of the Rocky Mountain region he named, a page later, *V. Rydbergii.* But the one is hardly distinguishable from the other.

The illustration of *V. rugulosa* is copied from a water-color painted May, 1915, of a specimen ex horto Middlebury, Vt., transplanted from Fort Snelling, Minn., 1911. No. 138 of my Distribution, 1910, represents the Rocky Mountain plant, cultivated from Boulder since 1898 at Bronx Park, N. Y., and also later at Middlebury, Vt.

Species No. 61—**Viola canadensis** L.

Viola canadensis L. Sp. Pl. 936. 1753. Species. No. 61.

This, the most widely distributed North American violet, ranges from New Brunswick to Saskatchewan, in the east, south to Alabama, and in the Rocky Mountains south to Arizona and New Mexico. Its habitat is wooded uplands, or in the South, mountain forests. Schweinitz, who lived at Salem, N. C., half way between Raleigh and the Blue Ridge, says it is rarely found there and exclusively in the higher mountains. I have a fruiting specimen from the most western county of South Carolina—House No. 2080, May 5, 1906—and I collected it in flower April 21, 1910, at Mount Tryon, N. C., and near Tuscaloosa, Ala., March 28, 1911, lat. 33°—the most southern known station.

Greene,[1] loth to believe one species could have so wide a range, published four "segregates" that do not appear to be specifically distinct. One he named *V. geminiflora,* the type from Nez Perce County, Idaho. Heller, June 20, 1896, lat. 46½°. I collected it August 21, 1897, on Sulphur Mountain, Banff, Alberta, altitude 6,500 ft., lat. 52°, and have a specimen from Millspaugh, collected June 9, 1913, at Ephraim, Door Co., Wis., lat. 45° 12′, that matches well with the two previous collections. It seems to be only a state of *V. canadensis* not infrequent, where only two flowers appear at the summit of the stem. I regard *V. discurrens, V. neo-mexicana* and *V. muriculata* as also unsatisfactory segregates.

We have selected to illustrate *V. canadensis* a reproduction of Reichenbach's t. 54, fig. 113, Ic. Pl. Crit. 1: 45, 1823. The two lower details represent the tip of a leaf and a sepal enlarged; but the figure of the plant is reduced to one-half its natural size.

[1] Pitt. 5:24. Sept., 1902.

Species No. 62—**Viola scopulorum** (Gray) Greene

Viola scopulorum (Gray) Greene, Pitt. 5: 27. Sept., 1902. Species No. 62.

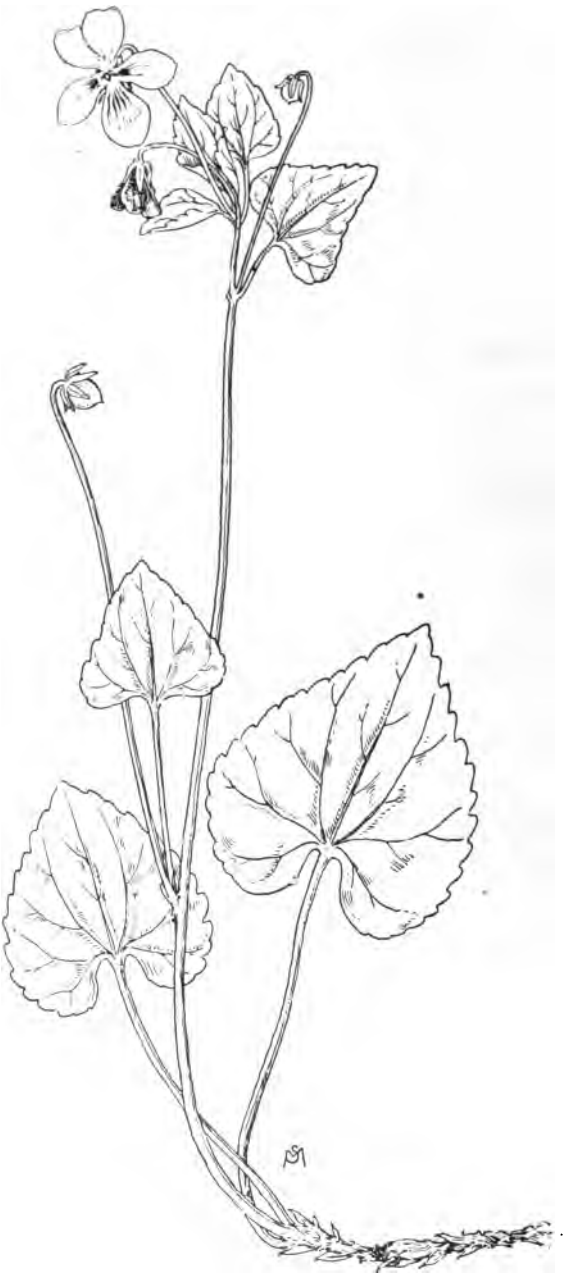
V. canadensis var. *scopulorum* Gray, Bot. Gaz. 11: 291, Nov., 1886.

Gray describes this variety thus: "A diminutive and depressed form of which the most characteristic form was collected in Clear Creek Cañon (Colorado) by Greene." This brief account is fully supplemented by Greene in Pitt. 5: 27.

Through the kindness of Mr. E. Bethel and E. R. Cross, I received living plants from the type station[1] and dried specimens from the vicinity, and after growing the plant for three years was thoroughly convinced of its right to specific recognition. The length of the stem and the size of the capsule, leaf and seed are but half that of *V. canadensis*. The stem branches freely, each branch bearing flowers and abundant fruit as the season advances.

Our line-drawing is from a herbarium specimen ex horto Middlebury, Vt., May 15, 1913, transplanted from Boulder, Colo., July, 1912. E. Bethel, collector and donor.

[1] Clear Creek Canyon, Colo.



Species No. 63—**Viola ocellata** Torr. & Gray

Viola ocellata Torr. & Gray, No. Am. Fl. 1: 142. July, 1838. Species No. 63.

A woodland species of limited range from Cow Creek Mountains, Ore., to Monterey County, Cal. The upper petals are dark purple; the lateral pale yellow to white with a violet spot at base of each, a character that suggested the specific name "the two-eyed violet"; the lower petal also yellow to white, larger, with several violet striae on the lower half. The rootstocks are often long and stolon-like, several from a bunch of coarse, fibrous roots; from them arise one or more radical leaves and flowering stems with a tuft of scarious stipules at the base.

Beautiful specimens of this species were collected April 15, 1916, in the Santa Cruz Mountains by my daughter, Mrs. Viola Brainerd Baird, of Berkeley, Cal. When put in press, strips of thin paraffin paper were laid over the flowers, to prevent their fading from contact with air or moisture. This method was so successful that even now after six years the color of the flowers, when the paraffin papers are removed, is nearly as good as in Mathews' water-color of this beautiful violet.

The line-drawing is based on a herbarium specimen from Mount Tamalpais, Cal., just north of the Golden Gate, collected June 6, 1899, by Miss Alice Eastwood.

Viola cuneata Watson, Proc. Am. Acad. 14: 290. 1879. Species No. 64.

One of the rarest of our western violets first collected in June, 1878, and described by Watson as follows: "glabrous: stem a span long, leafy, ascending from a short rootstock; leaves rhombic-ovate, acute, alternate at base with a slender petiole, crenately toothed above; petals deep purple, more or less bordered or blotched with white, beardless, 4 lines long; spur very short, yellowish; capsule glabrous.—Humboldt County, Cal., on a high, open ridge south of Trinity River; V. Rattan, June, 1878. Allied to *V. ocellata* and *V. Hallii.*" At about the same time this description also appeared in Brewer and Watson's Bot. of Cal., vol. 2, p. 433.

In Gray's final revision of Viola, November, 1886, he says under *V. cuneata* Wats., "mountain woods in the northern part of California and adjacent Oregon. Distinguished from the preceding (*V. ocellata*) by its smoothness and its rhombic-ovate or cuneate leaves, only the radical ones cordate." I have a specimen of this rare species collected by Miss Alice Eastwood in the northwest corner of California, Gasquets, Del Norte County, April 23, 1907; and also specimens from "dry soil in open forest, old Eddy place on Eddy Creek, Shasta Forest, Cal., altitude about 3,500 ft., Eggleston 11,563, August 11, 1915. Upon one of these latter plants is based the color-plate of this species, the flower being drawn like those of *V. ocellata* as described in the Synoptical Flora.

That the species is still rare is shown by the fact that Mrs. Viola Brainerd Baird has recently reported that the mounted specimens from California in the University Herbarium at Berkeley are all from the three northern counties on the coast and from the two adjacent counties of Trinity and Siskiyou.

See color-plate, Species No. 64, opposite page 132.

Species No. 65—**Viola Flettii** Piper

Viola Flettii Piper, Erythea 6: 69. 1898. Species No. 65.

Only four sheets of this rare and distinct violet are in the National Herbarium, viz.:

1. The type: "Seams of rocks, Olympic Mountains, Wash., July 20, 1897, collected by J. B. Flett, Tacoma, Wash." No. 529,412 Nat'l Hb.

2. Another specimen, "Rocks and crags, summit of Olympic Mountains, July 20, 1897, collected by J. B. Flett." A "cotype." No. 354,059 Nat'l Hb.

3. High cliffs of the Olympic Mountains, near Mount Constance, August, 1898, collected by J. B. Flett. In fruit, No. 529,411 Nat'l Hb.

4. Talus slopes near summit of Mount Angeles, Clallam Co., Wash., July 1, 1908, collected by J. B. Flett. No. 620,483 Nat'l Hb. This mountain is near the south coast of Strait of Juan de Fuca, long. 123½° W.

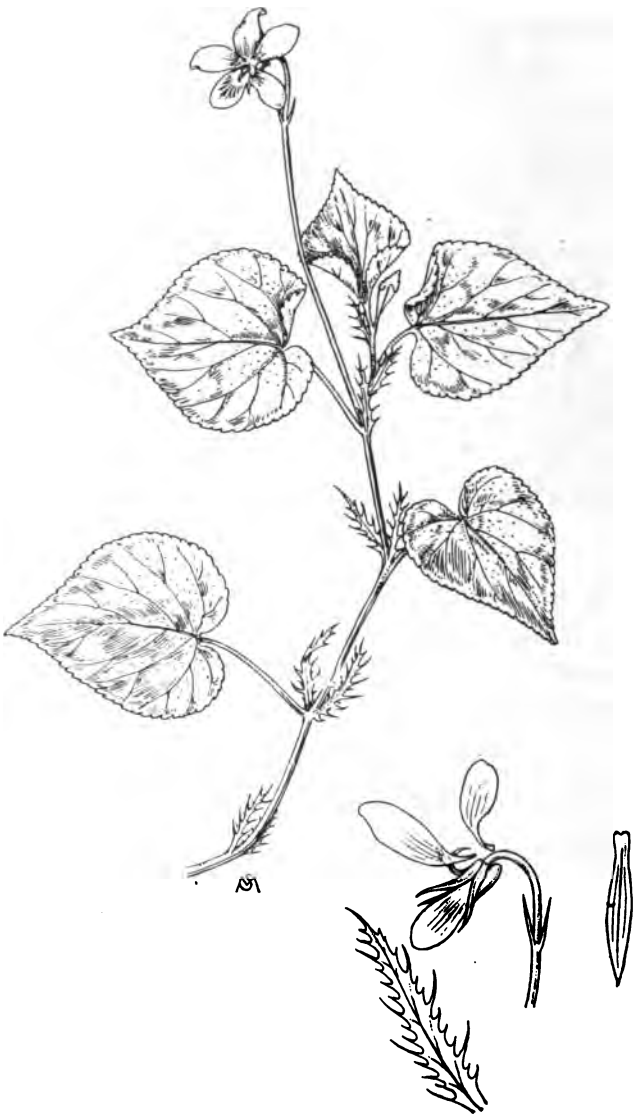
In Piper's Fl. of Wash., p. 394, 1906, a specimen is cited collected by Henderson, No. 1847.

In Piper's and Beattie's Flora of the Northwest Coast, p. 243 (1915) we are told that the species seems most nearly related to *V. cuneata* Watson (1879), i. e., in the structure and color of flower; but in aspect (i. e., foliage) the plant more closely resembles *V. glabella.* Piper describes the petals as "lavender-violet, yellow at base with dark purple veins." Some indication of the color of the petals is to be found in the type specimens and in that from Mount Angeles.

1. The upper petals are dark violet on outer surface or in bud.
2. The lateral petals are striate on the upper surface and bearded.
3. The spur petal is violet with long and numerous dark lines.

The flower is thus much as in *V. cuneata* or *V. ocellata.*

Our line-drawing is based for flowers on specimen 2, a "cotype," July 20, 1897; for fruit on specimen 3, Mount Constance, August, 1898.



Species No. 66—**Viola striata** Ait.

Viola striata Ait., Hort. Kew. 3: 290. 1789. Species No. 66.

Its habitat is low, shady ground and along streams; its range, New York to Minnesota, south to Georgia, and southwest Missouri, but apparently rare in the prairies of the Middle West. The specific name was doubtless suggested by the 8-10 purple lines, or striae, by which the spur-petal is adorned for over half its length. It is one of the most variable of our eastern violets.

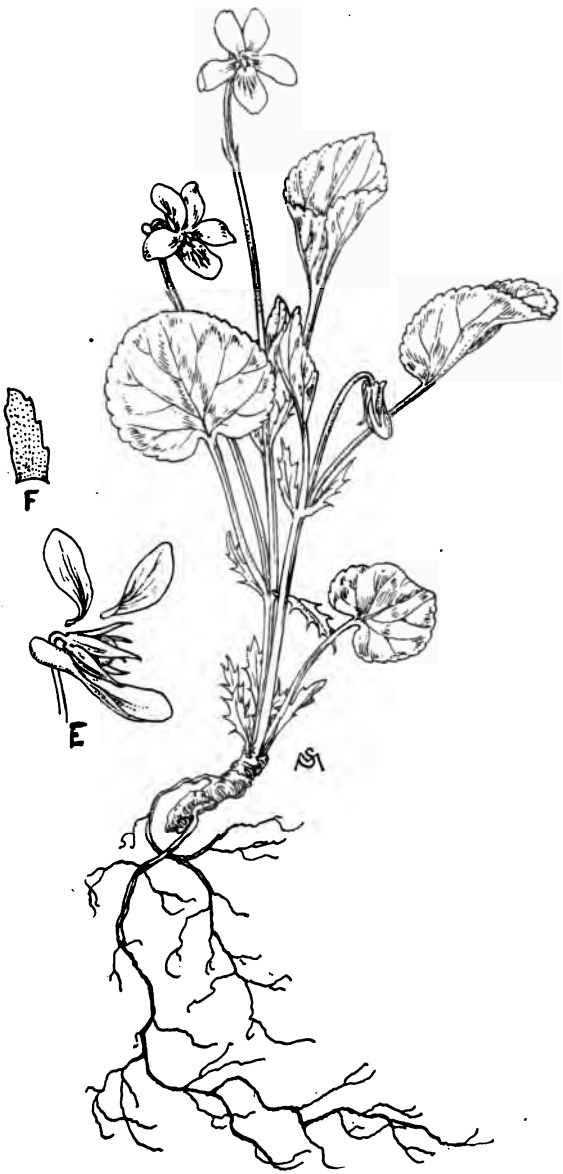
Apparently the species does not occur spontaneously in New England; the station reported for Connecticut is not recognized in the catalogue of the Connecticut Botanical Society, 1910. But in May, 1906, Mrs. Emily (Hitchcock) Terry sent live plants from her garden in Northampton, Mass., which have since increased with me amazingly in number and in size. One large clump dug up August 23, 1921, had a mass of long, fibrous roots, often branching, and 60 stems bearing cleistogamous flowers and capsules.

V. ochroleuca and *V. repens* of Schweinitz[1] are plainly synonyms of *V. striata* Ait. His long account of the habits of these plants as he found them in Salem, N. C., is most instructive. *V. ochroleuca* is tall, large-flowered, in rich soil, borders of ponds and meadows, flowering in April, with large, oblong-lanceolate, "quasi-ciliate" axillary-stipules. *V. repens* is decumbent, spreading and even creeping, with smaller flowers in May, on the rocks of the Saura Mountains in considerable patches, the axillary-stipules ovate, strongly fringed. One might suspect that *V. repens* was a local form whose prostrate stems rooted and became stolons, as in the kindred species *V. Walteri.*

On my southern trips in April, 1908, 1909 and 1910, I collected *V. striata* at several stations in the higher mountains of western North Carolina. One of these is No. 164 of my Distribution of Violets, 1910. In No. 165 is to be seen the autumnal state of the species as grown in Middlebury, Vt., from the Northampton stock.

The line-drawing is a reproduction of Reichenbach's "Plantae Criticae" 1: 45, t. 54, fig. 112, 1823; his specimen is said to be from Philadelphia.

[1] Am. Jour. Sci. V: 69-71. April, 1822.



Species No. 67—**Viola conspersa** Reichenb.

Viola conspersa Reichenb., Plantae Criticae 1: 44, pl. 52, fig. 108. 1823. Species No. 67.

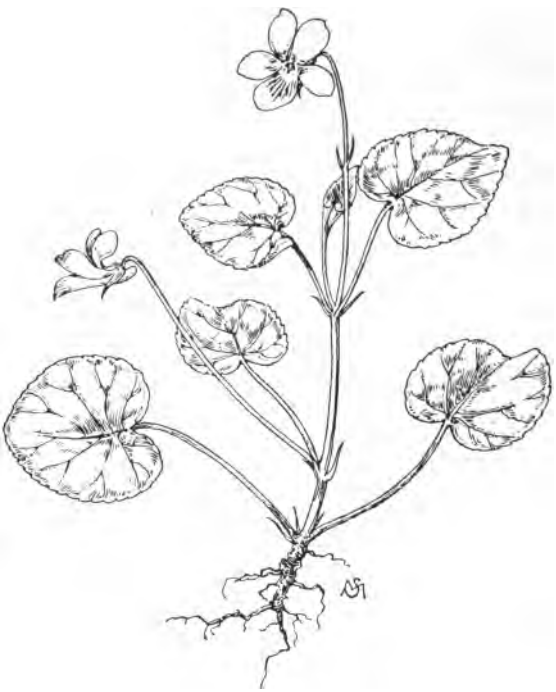
In addition to the color-plate we give a line-drawing of Reichenbach's fig. 108. In his description he states that the leaves are marked with black dots and lines on the lower surface, as is represented by the detail marked F in the line-drawing. This appearance doubtless suggested the specific name *conspersa,* i. e., besprinkled. However, this dotted or minutely speckled herbage is not a proper character, but the effect of a fermentation induced by enzymes in specimens poorly dried or later exposed to moisture and heat.[1] It has been observed in many species of *Viola,* and has suggested other specific names. Schweinitz, unaware of Schrank's *V. labradorica,* named specimens from Labrador *V. punctata* because they were covered with raised glandular dots.[2] *V. maculata* Cavan, from the Falkland Islands, is another similar name.

The earliest recognition of the plant is supposed to be the *"V. asarifolia"* of Muhlenberg's Catalogue; but this is a "mere name" and is antedated by *V. asarifolia* Pursh. Torrey[3] published it in 1824 as *V. Muhlenbergii.* Later, Gray[4] disposed of it as "var. *Muhlenbergii*" of *V. canina* L., an old world species. There the matter rested until in Britton's Ill. Fl., 1st ed., 1897, it was incorrectly identified with *V. labradorica* Schrank. In March, 1911, the present writer called attention to *V. conspersa* Reichenb. as the oldest available name.[5]

The known range of the species is from eastern Quebec to Minnesota and south to the mountains of northern Georgia. It is closely allied to *V. adunca* (No. 71) and to *V. labradorica,* which is found as far north as Greenland, and takes the place of *V. conspersa* in Newfoundland. Farther south *V. labradorica* occurs only in the high mountains of New England. See line-drawing No. 68, of a specimen of this from Mount Albert, Gaspe District, Que.

[1] See footnote, Rhod. 15: 110. June, 1913.
[2] foliis. . . . punctis glandulosis tectis.
[3] Fl. U. S. 1: 256.
[4] Bot. Gaz. 11: 292.
[5] Bull. Torr. Cl. 38: 195.

See also color-plate, Species No. 67, opposite page 160.



Species No. 68—**Viola labradorica** Schrank.

Viola labradorica Schrank, Denksch. Bot. Gesell. Regensb. 2: 12. 1818. Species No. 68.

V. punctata Schwein., Am. Journ. Sci. 5: 67-68. 1822.

V. Muhlenbergiana Hook., Fl. Bor. Am. 1: 178. 1830.

This small species ranges from Greenland south along the Labrador coast to Newfoundland, where it takes the place of *V. conspersa* Reichenb., thence to the mountains of the Gaspe Peninsula, altitude 2,300-3,500 feet, and of Maine, New Hampshire and New York. In habitat it reminds one of *V. glabella* of the far west, that ranges from arctic Alaska to middle California, near the cold waters of the coast or in the highlands of the Sierra Nevada at an altitude of 3,500 to 7,500 feet.

Schweinitz, when living at Salem, N. C., received specimens of Schrank's plant from his "revered friend, Rt. Rev. C. G. Hueffel," then a Moravian missionary in Labrador. In ignorance of Schrank's name he published the plant as *V. punctata* because of its minutely speckled herbage.

Our line-drawing is based on a herbarium specimen from Mount Albert, Gaspe District, Que., Collins and Fernald, coll., August 11, 1905.

Species No. 69—**Viola Walteri** House

Viola Walteri House, Torreya 6: 172. Aug., 1906. Species No. 69.
V. canina Walt., Fl. Car. 219, 1788; not L., 1753.
V. striata Ell., 1817; not *V. striata* Ait., 1789.
V. debilis Schwein., 1822; not *V. debilis* Michx., 1803.
V. Muhlenbergii var. *multicaulis* T. & G. Fl. 1: 140, 1838.
V. multicaulis (T. & G.) Britton, Mem. Torr. Cl. 5: 227, 1894; not Jordan, 1852.

This species is found in dry woodlands from Kentucky to South Carolina, south to Gainesville, Fla., and west to Texas. It flowers in early spring from a tuft of radical leaves; later it sends out an ascending but soon prostrate stem, bearing cleistogamous flowers through the season and at length rooting at the tip. In this method of reproduction it resembles *V. odorata,* classed as a stemless violet with surface runners that bear leaves and cleistogamous flowers and later form new plants. We have in *V. Walteri* a fine illustration of the metamorphism of stems into stolons.

The line-drawing shows a flowering stem, collected at Mansfield, La., March 28, 1910, and a fruiting stem ex horto Middlebury, Vt., August 29, 1911, transplanted from the Louisiana station.

Species No. 70—**Viola reptans** Robinson

Viola reptans Robinson, Proc. Am. Acad. 27: 165. 1892. Species No. 70.

V. Pringlei Rose & House, Cont. U. S. Nat. Mus. 29: 444. 1905.

The description is based on material collected in November, 1890, among the hills of Patzcuäro, Michoacan, Mex. (C. G. Pringle's No. 3591). For petaliferous flowers it should be supplemented by collections made in spring or summer.

Through the courtesy of Mr. W. R. Maxon, Associate Curator, the following specimens have been secured for study from the National Herbarium.

Town	*State*	*Latitude*	*Collector*	*Date collected*	*Number in National Herbarium*
Cuernavaca	Morélos	18° 55′	Rose and Hough	5/27-30/99	346,787
Pächucha	Hidalgo	20° 10′	Rose and Hough	6/1/99	346,440
Säläzär	Mexico	19° 30′	Rose and Painter	9/4/03	451,657
Patzcuäro	Michoacan	19° 30′	C. G. Pringle	7/3; 10/14/92	7,491
Cañon San Luis Mountains	Southwest corner of New Mexico	31° 30′	Dr. Edgar A. Mearns	9/11/93	233,392
Animas Valley				10/2/93	234,593
Dulce, Apache Reservation	New Mexico	36° 55′	Paul C. Standley	8/20/11	687,120

The petals of *V. reptans* are said by Robinson to be white with blue lines, but in one flower of No. 346 440 Nat'l Hb. the spurred petal has a distinctly violet color. Its form is here seen to be broadly cuneate marked with numerous delicate lines, the lateral petals having only a few branching lines from the bearded base.

The long range of the species northward from Cuernavaca to the north line of New Mexico, a distance of 18° in latitude or 1,243 miles, is noteworthy. But the southern stations are in the cool mountains of the Mexican plateau, which extends along the continental divide to Dulce, the station for No. 687 120 Nat'l Hb., where the altitude is 7,256 feet.

The line-drawing is based on Pringle's specimen No. 7491 Nat'l Hb., from the type station, collected the same year (1892) that the species was published by Robinson.

Excellent specimens are found in the Pringle Herbarium, University of Vermont.

Species No. 71—**Viola adunca** J. E. Smith

Viola adunca J. E. Smith, Rees's Cyclopedia 37, Viola No. 63. 1817. Species No. 71.

The type is said to be a plant brought by Mr. Menzies from the west coast of North America. The species is a northern one, growing in sandy or sterile soil and extending across the continent from eastern Quebec and Maine west to British Columbia—reaching southward in the Rocky Mountains to northern New Mexico, and along the Pacific coast to central California.

The plant is well marked by the downy pubescence of stem and leaf, the long spur of the flower, the abundance of cleistogamous fruit in late summer and by its dark brown seeds. But a plant of such wide range naturally assumes various aspects which tempt to the making of new names. The species, however, was disposed of by Gray[1] as simply a variety of *V. canina* L., coordinate with var. *Muhlenbergii* (now *V. conspersa*).

Soon began a movement in the opposite direction. In 1897[2] in Britton's Ill. Fl. the plant was described at the suggestion of Dr. Rydberg, as *V. arenaria* DC.[3]

The radical difference between these two species was set forth by the present writer in Rhodora 15: 106-111, pl. 104, June, 1913. Several other misapprehensions regarding *V. adunca* were pointed out. For example, the hooked spur that suggested the specific name is a most variable character, often tapering to a point instead of forming a hook, and often forming one or more protuberances on the upper side. Several pseudo-species have been founded on these trivial malformations, such as *V. oxyceras* (sharp-horned), *V. odontophora* (toothed), *V. unguiculata* (clawed), *V. drepanophora* (sickle-bearing), *V. mamillata* (nippled), *V. uncinulata* (finely barbed). Watson would distinguish all the forms with straight, blunt spurs as var. *longipes*. But both straight and hooked spurs are at times to be seen on the same plant. Greene has based numerous species on the contour of the leaves and on the character of the pubescence. A complete list of synonyms would contain 50 or more names.

The color-plate is of a specimen from a sterile pasture in South Bristol, Vt., May 24, 1914.

The line-drawing is of two plants from Lake Shawnigan, Vancouver Island, B. C., Prof. J. K. Henry, coll., May 9, 1915. The smaller plant shows a nearly stemless form.

[1] Bot. Gaz. 11: 292. Nov., 1886.
[2] Ill. Fl., 1st ed., 2: 454. 1897.
[3] Fl. Franc. 4: 806. 1815.

See also color-plate, Species No. 71, opposite page 160.

Species No. 72—**Viola Howellii** Gray

Viola Howellii Gray, Proc. Am. Acad. 22: 308. 1887. Species No. 72.

The history of this rare species of the Pacific coast is interesting. It was first collected by Thomas Howell near Portland, Ore., in coniferous woods. In the Bot. Gaz. for November, 1886, Gray "somewhat doubtfully" referred it to *V. mirabilis* L. with this brief description: "Stipules entire or nearly so, linear; flowers on scapes from the rootstock and few on 1- to 3-leaved ascending stems pretty large." A year later, however, he published *V. Howellii* as given above. In his "Flora of Northwestern America," p. 72, March, 1897, Howell gives a fuller and better description of the Portland type. In the Synop. Flora, October, 1905, two additional stations are cited: Klickitat County, Wash., Suksdorf, May, 1885, and Salem, Ore., Henderson. In Piper and Beattie's "Flora of the Northwest Coast," p. 243, 1915, the range is said to be "prairies and open woods, Vancouver Island to Oregon."

I find some additional data as to range in my own herbarium. (1) Shawnigan Lake, Vancouver Island, B. C., J. K. Henry, May 8, 1912; (2) woods, Nanaimo, Vancouver Island, J. K. Henry, July 2, 1912 and April 8, 1915; (3) a live plant was sent me September 11, 1917, from near Salem, Ore., by Geo. M. Darrow, and was grown for several years, bearing flowers and fruit in abundance, apparently not much modified by its new environment; (4) along Mosquito Creek, altitude 600 meters, Okanogan County, Wash., Eggleston, No. 13030, July 14, 1916, west of Colville Forest and about 20 miles south of British Columbia line.

Our illustration is based on a tracing of one of Suksdorf's specimens from western Klickitat County, Wash., above cited—No. 91,325 of the Field Museum, Chicago, reduced to two-thirds the natural size.

Species No. 73—**Viola Langsdorfii** Fischer

Species No. 67a—**Viola conspersa** Reichenb.

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Species No. 71a—**Viola adunca** J. E. Smith

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Species No. 73— **Viola Langsdorfii** Fischer

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Species No. 75—**Viola Rafinesquii** Greene

Dum spiro
spero

Viola Langsdorfii Fischer, D. C. Prodr. 1: 296. 1824. Species No. 73.

The type, from Aleutian Islands, Alaska, was collected by Chamisso, a distinguished son of a French nobleman, of whom we find an interesting account in the Encyclopedia Britannica. In 1815 he was appointed botanist on the Russian ship Rurik, and sent on a three years' voyage of exploration around the world. The type of the violet was published in Moscow by Regel as a variety of *V. mirabilis* L. From one of his figures we copy a line-drawing showing a stemless form of the species.

In 1893 the writer received from a former pupil, Rev. Dr. John Chapman, now a missionary of the Protestant Episcopal Church in Alaska, specimens of *V. Langsdorfii* from the type station on Unalaska Island. The plants are small without apparent stems, but the flowers are large, with broad petals, the three lower bearded at the base.

Prof. J. K. Henry of Vancouver City, B. C., collected (May 9, 1895) beautiful specimens of this violet on the moist margin of Lake Shawnigan, Vancouver Island. Our color-plate is based on two stems of this collection, in which the brown rootstocks are seen to be distinct from the short, green stem bearing a bud at the tip. In other plants this stem is one to one and one-half inches in length

In the Synoptical Flora a station is reported from Oregon, and in Howell's Flora of Northwest America, 1897, from Crescent City, Del Norte Co., Cal.; but it was left for Mrs. Viola Brainerd Baird to find a still more southerly station on the coast of California. On July 20, 1915, we visited Fort Bragg and Noyo in Mendocino County to identify a plant collected by Bolander in swamps at Noyo, 1867, and marked in pencil by Gray as "large *V. canina.*" We found the plants in abundance called *V. canina* L. var. *adunca* Gray in the Synoptical Flora, now passing as *V. adunca* Smith[1]; and while the specimens were being carefully put in press by the writer, Mrs. Baird had the good fortune to discover plants of *V. Langsdorfii;* and Noyo thus became its most southern station on the Pacific coast.

This species presents an interesting transition between the stemmed and the stemless violets. In Torrey and Gray's Flora (1838) the species is said to be caulescent; in the Synoptical Flora it is placed in a section headed "strictly acaulescent."

The line-drawing is a copy of Regel's t. 6, fig. 26, Bull. Soc. Nat. Moscow XXXIV, pt. 2, 472.

[1] Species No. 71.

See color-plate, Species No. 73, opposite page 160.

Species No. 74—**Viola rostrata** Pursh

Viola rostrata Pursh, Fl. Am. Sept. 1: 174. 1814. Species No. 74.

"On shady rocks near Easton, Pa." This is the only eastern violet that has no synonym, as its extremely long spur distinguishes it conspicuously from all other species. The spur, however, is variable. Normally straight and blunt, it is at times strongly hooked or attenuated to a fine point.

The species is otherwise closely allied to *V. conspersa* and indeed hybridizes with it. Some 13 years ago, I received a live plant of this from Plainfield, N. J., from which I raised numerous offspring represented in No. 31 of my Distribution of 1910. And only last May I collected the hybrid in a moist thicket not far from my home in Middlebury, Vt.

The species is found in leaf-mould, usually on shady hillsides, from western Quebec to Michigan and southward in the Appalachian Mountains to Georgia.

The line-drawing is copied from a beautiful water-color painted by Mathews, May, 1915, from a living specimen.

Viola Rafinesquii Greene, Pitt. 4: 9. Jan., 1899. Species No. 75.
V. bicolor Pursh, 1814, *not* Gilibert, 1781.
V. tenella Raf., 1819, *not* Poiret, 1810.
V. tricolor var. *arvensis* Gray in part, *not* D. C.

This species, the only American representative of the old world pansy group, is an annual, as is shown in our color-plate by the root and the pair of small seed-leaves at the base of the stem. Gray was reluctant to admit this violet as an indigenous species. In his final revision, October, 1886, he says, "I had always taken this field form of the pansy for a mere escape from cultivation, but in occurs in rather numerous localities from Canada to Texas; several botanists familiar with it insist that it is indigenous."

In his letter to Hooker, in 1841, we find the following statement regarding Constantine Rafinesque-Schmaltz, for whom this violet was named. "A Sicilian by birth, first arrived in the United States in 1802, for three years; returned in 1815, and explored the Alleghanies and Southern States. An eccentric but certainly gifted personage, connected with the natural history of this country for the last 35 years." Rafinesque died in 1840.

The range of *V. Rafinesquii* is from New York to Michigan, thence southwest to Dallas, Tex., and from New York south to the mountains of the western Carolinas and northern Georgia. But an isolated colony is reported from the foothills of Boulder, Colo.

Our color-plate was made from a painting by Mathews, which was based on a specimen from Baldwin, Kan., collected by Rufus Crane, April 19, 1913. The plant is also found in my Distribution of Violets, 1910, No. 128, from near Muskogee, Okla., April 4, 1910.

V. arvensis Murray is an old world species resembling *V. Rafinesquii* and is naturalized and even a troublesome weed in the South. It has petals usually shorter than the sepals; the petals of *V. Rafinesquii* are twice the length of the sepals.

See color-plate opposite page 160.

III. VIOLET HYBRIDS OF NORTH AMERICA

I am asked to prepare a statement for the Violet Bulletin, emphasizing the important function of hybridism in furnishing new forms for natural selection to work upon. This has led me to look over my mounted specimens of violet hybrids from the wi'd and from garden cultures. The large number of sheets that I find is surprising even to myself—984—about as many as my herbarium sheets of the species. The total number of distinct hybrids is 89, of distinct species 75.

I may here state that in my first paper on hybrids (Rhodora 6: 213-223, pl. 58, Nov., 1904) the eight there described were from familiar species and were correctly determined as to parentage, and the parents designated by valid names. In March, 1906, 16 months later, I described 25 other hybrids occurring along the southeastern New England coast and southward. Some 11 of these hybrids were between a pair of species, at least one of which was currently passing under an invalid name. On account of this unsettled condition of specific names I deemed it best for a while not to publish the supposed parental names of a hybrid, and, accordingly, for a period of six years I devoted my study of *Viola* largely to the work of clearing up this nomenclatorial confusion. I visited the herbaria and libraries at Cambridge, Mass., Bronx Park, N. Y., Washington, D. C., Charleston, S. C. and St. Louis, Mo. I collected abundant herbarium specimens in the southern and southwestern States, shipping home living plants of both hybrids and species for garden cultures on as large a scale as practicable.

I have given an account of my work on the 75 species of North American violets in the preceding pages; and in the six which follow appears a list of the 89 hybrids which I have in my herbarium. The facts concerning their distribution, the number of sheets of each hybrid in my herbarium and, in cases where the hybrid has been discussed, the place of publication are also cited.

A detailed discussion of violet hybrids will appear in a future bulletin of this Station.

NAME	STATIONS	SHEETS IN HB. E. B.	WHERE PUBLISHED
V. adunca × *conspersa.*	Proctor, Vt. Little Notch, Bristol, Vt. Ex horto 1911, 1912. Ottawa, Ont., 1904.	5	Ined.
V. affinis × *Brittoniana.*	Bradley Ave., Staten Is., N. Y. Ex horto 1911.	2	Ined.
× *cucullata.*	Middlebury, Vt. Eastern Conn. Ex horto from W. J. Vreeland	4	Rhod. 8: 49. Distrib. 1910, No. 7.
× *emarginata.*	Englewood, N. J. Ex horto 1908, 1910	2	Ined.
× *fimbriatula.*	Staten Island, N. Y. New Jersey. Pennsylvania. Ex horto.	15	
× *hirsutula.*	Glen Alpine, D. C., 1908. Kenilworth, N. J., 1910.	7	Rhod. 8: 56. Rhod. 8: 119.
× *nephrophylla.*	Providence Is., South Hero, Vt., 1905, 1907, 1910. Ex horto 1906.	5	Rhod. 8: 50. Distrib. 1910, Nos. 8 and 9.
× *palmata.*	Penfield, N. Y., 1910. Ex horto 1911, 1912.	1	
× *papilionacea* House.	Woodridge, D. C. Medford and Plainfield, N. J. Tinicum, Pa.	15	Rhod. 8: 119.
× *sagittata.*	Patuxent, Md. Tinicum, Pa. Staten Is., N. Y. Milltown, N. J.	17	Rhodora 8: 55. Amer. Naturalist 44: 235. Distrib. 1910, Nos. 10 and 11.
× *septentrionalis.*	Knight's Is., North Hero, Vt. Middlebury, Vt.	5	Rhod. 6: 219.
× *sororia.*	Diadem Is., North Hero, Vt. Middlebury, Vt. Canandaigua, N. Y. New York Bot. Garden, from Quebec.	7	Rhod. 6: 221
× *triloba.*	Plainfield, N. J. Clark Co., Ind.	7	Distrib. 1910, Nos. 18, 19 and 20.

NAME	STATIONS	SHEETS IN HB. E. B.	WHERE PUBLISHED
V. Brittoniana × *cucullata.* "*septemloba.*"	Woodmere, Long Is., N. Y. Fairfield and Stratford, Conn. Milton and Springdale, N. J.	34	House, Bull. Torr. Cl. 32: 255, t. 17. Science N. S. 15: 940. Torreya 4: 131
× *emarginata.*	Hyattsville, Md.	1	Brainerd, Rhod. 8: 53. House, Rhod. 8: 120, t. 71.
× *fimbriatula.*	Hempstead, Long Is., N. Y. Staten Is., N. Y. Fairfield, Conn.	12	Brainerd, Rhod. 8: 51, t. 67. Distrib. 1910, Nos. 21 and 22. Dowell, Bull. Torr. Cl. 37: 172
× *lanceolata.*	Charles River Meadows, Dedham, Mass.	1	Forbes, Rhod. 11, 14.
× *papilionacea.*	Staten Is., N. Y. Hempstead, N. Y.	8	Dowell, Bull. Torr. Cl. 37: 173, t. 14. Distrib. 1910, No. 23.
× *pectinata.*	Hempstead, Long Is., N. Y. Dayton, N. J. Stratford, Conn. Dedham, Mass.	13	Rhod. 8: 59, pl. 69.
× *sagittata.*	Riverdale, Md. Staten Is., N. Y.	2	Brainerd, Rhod. 8: 51. House, Rhod. 8: 120.
× *sororia.*	Fairfield, Conn.	1	
× *triloba.*	Milltown, N. J. Stratford, Conn.	5	Rhod. 8: 55, where called "*V. palmata* × *septemloba.*"
V. conspersa × *rostrata.*	Plainfield, N. J. Middlebury, Vt.	5	Distrib. 1910, No. 31.
V. cucullata × *fimbriatula.*	Newfane, Salisbury and Middlebury, Vt. Jaffrey, N. H. New York. Connecticut. New Jersey. North Carolina.	28	Distrib. 1910, Nos. 34, 35, 36 and 37.
× *nephrophylla.*	Manchester, Vt.	1	
× *palmata.*	East Lyme, Conn.	1	

NAME	STATIONS	SHEETS IN HB. E. B.	WHERE PUBLISHED
V. cucullata × *papilionacea.*	Northampton, Mass. Plainfield, N. J. North Tacoma, D. C. East Lyme and Southington, Conn. Yonkers, N. Y.	8	Rhod. 8: 56.
× *pectinata.*	Woodmere, Long Is., N. Y.	1	
× *primulifolia.*	Woodmere and Rosedale, N. Y.	2	Rhod. 11: 115.
× *sagittata.*	Tinicum, Pa. Montclair, N. J.	7	Rhod. 8: 52. Distrib. 1910, No 38.
× *septentrionalis.*	Silver Lake, Leicester, Vt. Charlottetown, Prince Edward's Is.	13	Rhod. 6: 220. Distrib. 1910, Nos 39 and 40.
× *sororia.*	Widely distributed from Vermont to Wisconsin and south to Virginia.	18	Rhod. 6: 222. Distrib. 1910, Nos 41 and 42.
× *triloba.*	Lexington, Mass. East Lyme, Conn. Rochester, N. Y.	8	Rhod. 8: 56 as amended Rhod. 11: 115.
× *viarum.*	Spontaneous in garden in 1912.	2	
V. emarginata × *fimbriatula.*	Washington, D. C. New Brunswick, N. J. Philadelphia, Pa.	8	Rhod. 8: 57.
× *Lovelliana.*	Muskogee, Okla.	2	
× *palmata.*	Eutaw Springs, S. C.	1	
× *papilionacea.*	Brookland, D. C. Ivy Hill Cemetery, Philadelphia, Pa. Milltown, N. J.	4	
× *sagittata.*	Brookland, D. C. Chester Co., Pa. Milltown, N. J.	6	
× *septemloba* House.	Gilmerton, Norfolk Co., Va.	1	Ined.
× *sororia.*	Carthage, Mo.	1	
× *Stoneana.*	Ivy Hill Cemetery, Philadelphia, Pa. Ex horto 1905, 1907.	1	
× *triloba.*	Tryon, N. C.	1	
× *triloba* var. *dilatata.*	Westville, Okla. Mena, Ark.	4	

NAME	STATIONS	SHEETS IN HB. E. B.	WHERE PUBLISHED
V. emarginata var. *acutiloba* × *fimbriatula.*	Brookland, D. C.	1	
var. *acutiloba* × *sagittata.*	North Tacoma, D. C.	1	
V. emarginata lobed form × *papilionacea.*	Brookland, D. C. Ex horto 1905, 1906, 1907, 1910.	5	
V. fimbriatula × *latiuscula.*	Ft. Ethan Allen, Essex, Vt.	10	
× *palmata.*	Rochester, N. Y. Mt. Tryon, N. C. East Lyme, Conn. Spring Valley, N. Y.	10	
× *papilionacea.*	Connecticut. New Jersey. New York. Pennsylvania. District of Columbia.	22	Rhod. 6: 218. Rhod. 8: 54.
× *sagittata.*	Massachusetts. Connecticut. New Jersey.	28	Rhod. 8: 57, pl. 68.
× *septentrionalis.*	Maine. Middlebury, Vt. New Hampshire. Massachusetts. Prince Edward's Is.	20	Rhod. 6: 215, pl. 58.
× *sororia.*	Middlebury, Vt. Hempstead, N. Y.	4	Rhod. 6: 218. Distrib. 1910, Nos. 58 and 59.
× *triloba.*	Lexington, Mass. New Hampshire. Connecticut.	9	Rhod. 8: 53, pl. 70, for "*palmata*" real *triloba.*
V. hirsutula × *palmata.*	Plainfield, N. J.	4	Torr. Bull. 39: 96.
× *papilionacea.*	Philadelphia, Pa. Ohio. North Carolina. Connecticut. New Jersey. District of Columbia.	21	Rhod. 9: 211. Science, N. S. 25: 941. Distrib. 1910, No. 66.
× *sagittata.*	Kenilworth, N. J. Ex horto 1911.	1	
× *sororia.*	New Jersey. Rockville, D. C. Tryon and Biltmore, N. C.	7	
× *Stoneana.*	Hyattsville, Md. Philadelphia, Pa. Brookland, D. C.	10	Torr. Bull. 39: 96.

NAME	STATIONS	SHEETS IN HB. E. B.	WHERE PUBLISHED
V. hirsutula × *triloba.*	New Jersey. District of Columbia. Virginia. North Carolina. Morristown, Tenn.	18	Rhod. 8: 56, as "*V. palmata* × *villosa.*" Torr. Bull. 39: 95.
× *triloba* var. *dilatata.*	Decatur, Ala. Ex horto 1910.	3	
V. Langloisii × *rosacea.*	Crowley, La. Ex horto 1910.	1	
V. latiuscula × *sororia.*	Lake Dunmore, Salisbury and West Rutland, Vt. Williamstown, Mass.	4	
× *triloba.*	Salamanca, N. Y. Ex horto 1910, 1912.	16	Torr. Bull. 39: 94.
V. Lovelliana × *papilionacea.*	Edgewood, Okla. Ex horto 1910.	3	
V. missouriensis × *sororia.*	Kansas. Missouri.	2	
V. nephrophylla × *papilionacea.*	Racine, Wis.	4	Distrib. 1910, Nos. 87 and 88.
× *pedatifida.*	Beulah, New Mex.	0	Torr. Bull. 40: 259.
× *sororia.*	Manchester, Vt.	2	
V. odorata × ———.	Bronx Park, N. Y. Florida.	2	
V. pallens × *primulifolia.*	Staten Is., N. Y. Seabrook, N. J.	4	Torr. Bull. 37: 177, pl. 18.
V. palmata × *papilionacea.*	Tryon, N. C. Plainfield, N. J. From Miss Kittridge 12. Miss Angell 6. Miss Kaufman 11.	92	Torr. Bull. 39: 85, pls. 5 and 6.
× *sagittata.*	Staten Is. and Rosedale, N. Y. West Orange, N. J. Haddenfield, N. J.	3	Rhod. 15: 115, No. 6.
× *sororia.*	Hamilton, Co., Ohio.	1	
× *triloba.*	Maryland Heights, Md. East Lyme, Conn. Orange, N. J. *Bucks Co., Pa.	20	Torr. Bull. 39: 88, pls. 5, 6 and 7. Distrib. 1910, No. 97.
V. papilionacea × *pedatifida.*	Yorkville, Ill. 64 Stark Co., Ill. 11	75	Torr. Bull. 40: 249, pl. 15.

*25 miles north of Philadelphia.

NAME	STATIONS	SHEETS IN HB. E. B.	WHERE PUBLISHED
V. papilionacea × *sagittata.*	Glastonbury, Conn. New Brunswick, N. J. Staten Is., N. Y. Tinicum, Pa.	11	Rhod. 8: 54. Distrib. 1910, No. 113.
× *sororia.*	Southeastern New York. Ohio. Wisconsin. Kansas. Missouri. Louisiana.	13	Torr. Bull. 37: 178. Distrib. 1910, No. 114.
× *Stoneana.*	Ivy Hill Cemetery, Philadelphia, Pa.	9	
× *triloba.*	Along the coast from East Lyme, Conn. to South Carolina.	35	Torr. Bull. 39: 90.
V. pedatifida × *sagittata.*	Peoria Co., Ill.	20	Torr. Bull. 40: 252, pl. 16.
× *sororia.*	Galva, Ill. 21 Ex horto Middlebury 115 Miscellaneous 18	154	Torr. Bull. 40: 253, pl. 17.
V. rosacea × *sagittata.*	Crowley, La. Ex horto 1910, 1911.	3	
V. rostrata × *striata.*	Cincinnati, O.	2	
V. sagittata × *sororia.*	Milwaukee, Wis. Ex horto 1910, 1907.	4	Distrib. 1910, Nos. 142 and 143.
× *triloba.*	New Brunswick, N. J. Ex horto 1906.	6	Rhod. 8: 54, [where for *"palmata"* read *triloba*]. Rhod. 15: 115.
V. septentrionalis × *sororia.*	Middlebury, Vt., 3 stations. Arlington, Vt.	6	Rhod. 6: 221. Distrib. 1910, No. 157.
V. sororia × *triloba.*	Orwell, Vt. Connecticut. Long Island, N. Y. New Jersey. Biltmore and Tryon, N. C.	12	Torr. Bull. 39: 92.
V. Stoneana × *triloba.*	Ivy Hill Cemetery, Philadelphia, Pa.	14	Torr. Bull. 39: 93. Am. Naturalist 44: 231.

PUBLICATIONS OF EZRA BRAINERD ON VIOLA

1. Notes on New England violets I. Rhodora 6: 8-17. Jan., 1904.
2. Hybridism in the genus Viola. Rhodora 6: 213-223. Nov., 1904.
3. Notes on New England violets II. Rhodora 7: 1-8. Jan., 1905.
4. Notes on New England violets III. Rhodora 7: 245-248. Dec., 1905.
5. Hybridism in the genus Viola II. Rhodora 8: 6-10. Jan., 1906.
6. Hybridism in the genus Viola III. Rhodora 8: 49-60. Mar., 1906.
7. Behavior of the seedlings of certain violet hybrids. Science 25: 940-944. June, 1906.
8. Older types of North American violets. Rhodora 9: 93-98. June, 1907.
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10. V. chinensis in the eastern United States. Rhodora 10:38-40. Mar., 1908.
11. Viola. Gray Man. (ed. 7) 579-587. Mar., 1908.
12. Another hybrid between a white and a blue violet. Rhodora 11: 115-116. June, 1909.
13. The evolution of new forms in Viola through hybridism. Am. Naturalist 44: 229-236. Apr., 1910.
14. Five new species of Viola from the South. Bull. Torr. Club 37: 523-528. Nov., 1910.
15. Viola palmata and its allies. Bull. Torr. Club 37: 581-590. Dec., 1910.
16. Further notes on the stemless violets of the South. Bull. Torr. Club 38: 1-9. Jan., 1911.
17. The caulescent violets of the southeastern United States. Bull. Torr. Club 38: 191-198. Mar., 1911.
18. Violet hybrids between species of the palmata group. Bull. Torr. Club 39: 85-97. Apr., 1912.
19. Species of Viola. Britton & Brown's Illustrated Flora, Ed. 2, 2: 545-563. Apr., 1913.
20. Species of Viola. Small's "Flora" 800-807 (ed. 2). July, 1913.
21. Four hybrids of Viola pedatifida. Bull. Torr. Club 40: 249-260. June, 1913.
22. Is V. arenaria indigenous to North America? Rhodora 15: 106-111. June, 1913.
23. Notes on new or rare violets of northeastern America. Rhodora 15: 112-115. June, 1913.
24. V. septentrionalis in British Columbia. Rhodora 17: 70-71. Jan., 1915.
25. Flora of Rocky Mountains and adjacent plains. Rydberg 566-569. Jan., 1918.

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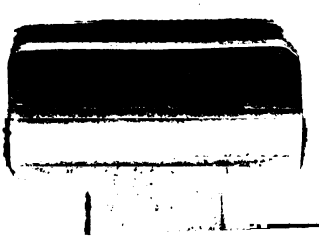
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